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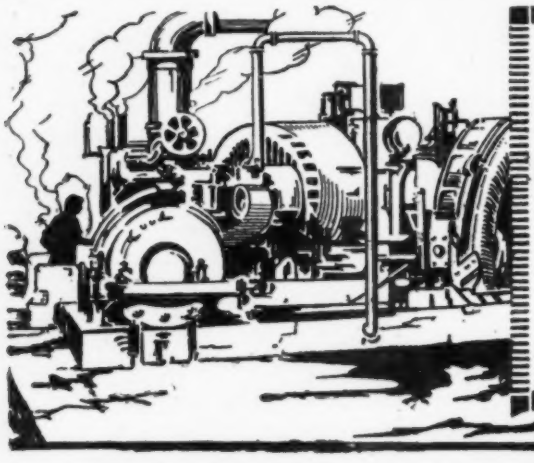

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Industrial Germany.

THE Department of Overseas Trade recently issued a report on the economic and financial conditions in Germany, revised to April, 1924, by Mr. J. W. F. Thelwall, commercial secretary to the Embassy in Berlin, together with a report on the occupied territories by Mr. C. J. Kavanagh, commercial secretary in the occupied districts at Cologne.

Questions of finance and foreign trade occupy at least one-third of the space in the two reports; the coal and iron and steel industries, as is only natural from the prominent positions which these branches hold in the country, are dealt with at some length, and the supply of electricity from steam power and hydro-electric works forms the subject of information extending over a number of pages, while the remainder of the reports discusses matters of legislation, labour and wages, with short references to the machine industry, the Solingen cutlery trades, the potash industry and the illuminating branch.

Excepting the last-mentioned, which refers to the production and foreign trade in electric lamps and carbons, &c., in the years 1920 and 1921, the reader will not find any particulars of the electrical manufacturing industry or the shipbuilding trade. But the authors of the reports cannot be blamed for these omissions, seeing that the leading interests in the German electrical industry, as well as in other branches, still continue to observe great reticence in the matter of any developments in their individual spheres of activity.

Besides leaving out of consideration questions of finance it will also be unnecessary for us to enter upon matters effecting the coal and iron and steel industries. The creation of large industrial combinations may be remembered as having occupied a prominent position in former years. Now, however, the establishment of such trusts appears to have ceased, at any rate temporarily, and to have been succeeded by the less obtrusive alliances which are effected by the exchange of shares. It would be difficult, the report states, to find a company even of moderate size which is not interested in this way in at least half-a-dozen others, with the result that the true distribution of interests is obscured to an extent

that is baffling to the uninitiated. As distinct from the trusts the organisations known as unions, associations, and cartels, which regulate business conditions and prices for a number of firms or whole branches of industry, have lost both in popularity and in power, partly owing to legislation which has been passed against them, and partly to the desire of the individual person or company to have greater freedom of action in times of difficulty. Apart from combinations and the subjects already mentioned, there only remain within the scope of this journal matters of light and power supply and railway working, although it should be noted that the export trade in electrical machinery and parts, which totalled 41,882 metric tons in 1913, is reported to have risen from 23,697 tons in 1922 to 26,937 tons last year.

The question of electric railway working does not appear to have yet made much progress in Germany. In former years such work of conversion in Prussia was always vetoed for military considerations; it remains for the future to decide whether any alteration in this respect will be made now that all the railways in the different Federal States have been amalgamated into a general railway system for the whole of the Reich.

The utilisation of the water powers of the country has engaged attention on many occasions in the course of the present century. Bavaria has occupied the leading position in this respect; the maximum plant installed at the hydro-electric works in this State amounted to 426,000 h.p. at the beginning of last year, and a further 528,000 h.p. was in course of construction with the financial participation of the State, while the water power still at disposal is computed at over 2,000,000 h.p. In Baden some 200,000 h.p. is being exploited out of a total of 1,000,000 h.p.; Wurtemburg has a few stations of small size, while the Prussian stations at the sources of the Weser and the Main, which yielded 10,000,000 kW-hours in 1922, were converted into a State company last year. Concerning the steam power stations it is mentioned that no figures have been published in recent years, and great reluctance is shown to disclose the progress made.

In conclusion, a few remarks may be appropriate on the subject of labour. The eight-hour day was re-established in January, 1924, but provisions are made for a number of exceptions, the true significance of which, according to the report, it is difficult for anybody but an expert to understand. It may, however, be said that the eight-hour day is the legal maximum, but in practice it is very little observed, as the strong position occupied by employers owing to unemployment is being utilised by them in compelling labour to work for low wages and long hours.

The Rubber Position.

AT the commemoration dinner held last week at the Hotel Cecil, with Sir Eric Geddes (of the Dunlop Rubber Co.) as the guest of honour, attended by representatives of practically all branches of the rubber trade, the general positon of the industry was discussed at some length. The over-production which synchronised with the post-war slump in trade, resulting in rubber falling to 6d. a lb., was undoubtedly mainly responsible for the trying times which have assailed all branches of the industry during the past few years. It was to combat this and to endeavour to stabilise prices at a level at which both producers and manufacturers could operate profitably, that the Stevenson scheme of restriction of output was put into force. The weak point in this scheme was that it applied only to plantation growers in Malay and Ceylon, the Dutch producers, whose annual contribution reaches a formidable total, not being parties to it, and being thus enabled to derive whatever benefit came from the scheme without accepting any responsibility. Notwithstanding this, the Stevenson plan had the immediate effect of restoring prices to about 1s. 6d. per lb., but subsequently with large stocks hanging over the market and very heavy tapping by the Dutch producers, the price gradually slipped back again to about 9½d. a lb. Opinion is now divided as to the real value of the scheme, and various suggestions have been mooted from time to time for assuring a successful future for the industry. Considering its extent and its far-reaching influence, the rubber industry is of comparatively recent origin. Even less than 20 years ago production was only about one eighth of what it is to-day, and practically the whole of it consisted of wild rubber; while to-day wild rubber has been relegated to a place far in the background by the plantation product. The enormous expansion of the automobile industry has naturally proved an influential factor in this connection, and, in spite of the greatly increased life of tires to-day, is still the predominant influence, the total world's output of tires for 1924 being estimated at some 50 millions. Notwithstanding this and considerable expansion in other directions, the potential capacity of the plantation area already in bearing is fully equal to the consumption, and with fresh ground reaching maturity every year it is imperative that active propaganda and research work should be carried on in order that consumption may continue to progress and absorb the growing output. It is also very desirable that fuller and more free communication of statistics and other matters of general interest to the trade at large should be developed.

The immediate outlook is none too brilliant, for even with Malayan production restricted, the world's output is somewhere in the neighbourhood of 400,000 tons annually, while consumption (including large quantities of reclaimed rubber) will probably run somewhere about 450,000 to 460,000 tons during the current year. The easiness recently apparent in prices will no doubt be checked sooner or later by the provisions of the Stevenson scheme whereby a cumulative reduction of exports from Malaya and Ceylon comes into force when the average price for a quarterly period is below 1s. per lb. Dutch planters have taken every advantage of the Stevenson scheme to increase their output, but expansion will probably be slower now that existing areas under Dutch control are producing practically at their maximum. Should the proposed Central Selling Agency mature it would provide a further stabilising influence on prices, and with prospects of the American automobile industry reviving during the latter part of the year, consumption should pick up again, and the end of the year surplus stocks show a material reduction from those held at the end of 1923. So much, of course, depends upon the settlement of political difficulties and the re-habilitation of trade generally, that forecasts are very hazardous, but if the present tendency towards co-operation both by producers and consumers be maintained, the rubber industry should in the long run show a steady expansion and improvement.

The New I.E.E. Wiring Rules.

THE new edition of the I.E.E. Wiring Rules, which have so long been under revision, is now on the point of issue, and we hope to review it at an early date. The work has been in the hands of a large committee thoroughly representative of all sections of the industry, and we understand that the new version has been accepted by the Fire Insurance Offices, electricity supply authorities, wiring contractors, and consulting engineers, for use in installations with which they are severally concerned.

Mr. C. H. Wordingham, C.B.E., was chairman of the committee and presided over its deliberations until his illness last year necessitated a relaxation of his activities; since then Mr. Ll. B. Atkinson, vice-chairman, has been in charge of the work, and has brought it to fruition. The task of reconciling so many diverse interests and harmonising discordant views has been, as is well known, a heavy one, and the thanks of the industry are due to these gentlemen and to the other members of the committee for the great amount of time and labour that they have voluntarily expended on this "work of national importance."

The World Power Conference at the British Empire Exhibition.

(Continued from page 130.)

Power from "Other Sources."

On Friday afternoon, July 4th, a meeting was held in Hall III to consider a series of papers grouped under the heading of "Power from Other Sources." The chairman was Mr. J. C. Thomsen (Denmark), and the papers were concerned with wind power, water power, alcohol as a source of power, and the natural steam power plant with which the name of Prince Conti has become associated in Italy.

The first paper dealt with was that on alcohol as a source of power, the author of which was Sir Charles Bedford. This once more raised the question which has been retarding the development of industrial alcohol in this country and the Empire for many years, *viz.*, the Excise difficulty. Within the Empire there are many sources available, some of which have already been proved to be commercially practicable. As a matter of fact, before the war the conversion of waste vegetable matter into alcohol in Africa was carried out at a cost of 3d. per gallon. Then came the problem of transport not only from the ports to this country or elsewhere, but from the interior of Africa, where it was necessary to go for the raw materials. Those most interested, however, appreciated that in the petrol companies they had formidable competitors who would not stand on ceremony if it came to a fight. Indeed, the position a few years ago, when the subject was being taken up very prominently on the occasion of the Imperial Motor Transport Conference, was that the only hope for establishing an alcohol industry for the Empire was to work with the petrol companies, so that the latter would do the distribution and, as a necessary corollary, the price of alcohol was to be the same as that of petrol. Whether for these reasons or not, developments in the production of alcohol for industrial purposes from the purely manufacturing side have not been very rapid, and very little is being done at the moment. Perhaps the prophecy that the United States will not be able to produce any natural petroleum oil in a matter of 25 years from now—which comes from no less an authority than Sir Richard Redmayne—may have some influence on the situation. Those interested in production say that not much can be done until Government restrictions are removed, whilst Government departments say that when they are convinced that appreciable quantities of alcohol are available, they will go into the matter.

Sir Charles Bedford pleaded for some concerted action in order to evolve a cheap process for making industrial alcohol from such waste vegetable materials as cereal straws, wood waste, sawdust, and waste vegetable matter generally. One fact not made too prominent is that whereas formerly native labour in a country like Africa, for instance, was very cheap, the present state of unsettlement manifested by organised white labour in England and other countries seems to have extended to the native overseas. His habits are so simple and his wants so few that it takes a great deal of persuasion to induce him to work with that concentration, in the parts of the world where this work has to be done, which is necessary for commercial success. The difficulties in front of the successful marketing of industrial alcohol are many, even when manufacturing and Governmental difficulties have been overcome, and all that Sir Charles Bedford's paper amounted to was a plea for more co-operation all round.

The utilisation of natural steam arising from volcanic fields is an intriguing subject, and not a great deal concerning it has been published. This form of power is being exploited in Italy and also in California, and although at first sight it might appear to be a very uncertain form of power, Prince Conti is able to maintain a plant generating 2,500 kW from natural steam with great certainty. Moreover, at the present moment, it is stated, the cost of working this type of plant is less than the cost of wind power for driving electrical generating machinery. There is a similar source of power in New Zealand in considerable quantities, but it is so far from the centres of population, and water power is so abundant, that it is improbable that it will be developed in the near future. There is one spot there where steam has been issuing from the rock through an opening some 6 in. by 2 in. at a pressure of about 180 lb. per sq. in., in a highly superheated condition, and it is said to have been doing this throughout the memory of the oldest inhabitant. Prince Conti is doing the work purely from a scientific point of view, and is in the happy position of not wanting to make money out of the venture. At one time the steam was used by capturing it as it issued from the ground, but now a scientific system of boring for it has been evolved, and it is said that even with borings at relatively close intervals, the supply is maintained constant. It is even suggested that these borings, by releasing steam, are a factor in preventing earthquakes.

There was not much discussion on the papers relating to the use of wind power for driving electrical machinery. Like the use of natural steam, the application must necessarily be a limited one. We have been familiar with the driving of dynamos for country house lighting in this way in this country for many years past, but it can only be regarded as a stand-by owing to the vagaries of the elements. In Holland and Sweden, however, they have gone in for this form of driving on a much larger scale, and it is not without interest that the old Dutch form of windmill is giving way to more modern types. The question whether it pays to use windmills for electrification purposes is one that cannot be answered generally. Much depends on local conditions, and it was admitted in the discussion that the papers on this subject dealt with problems yet to be solved.

Gas and Fuel.

Two Conferences were held in Hall II on Monday, July 7th, under the heading of "Gas and Fuel Section," with Mr. D. M. Watson in the chair. There was a series of papers dealing with purely gas subjects and others relating to low-temperature carbonisation and allied matters. In the morning, however, the outstanding point was that made by Sir Arthur Duckham—that there must be co-operation between the gas and electrical industries in relation to fuel supplies. The contention was once more raised that in appointing the Electricity Commissioners—whose work Sir Arthur Duckham praised very highly—the Government had only tackled half the problem, and that there must be appointed Fuel Commissioners to superintend the most efficient use of all classes of fuel and their application. In a sense, the impression was rather given that the gas industry felt that the Government had favoured the electrical industry, but, on the other hand, coupled with this urgent suggestion that the whole of the fuel resources of Great Britain should come under the control of a body of Fuel Commissioners, there came an even more urgent appeal that the gas industry should not come under any further direct Government control than was at present exercised under the Gas Regulation Act of 1920 and the many private Acts of Parliament applying to the various undertakings.

Whilst all this talk of co-operation between gas and electricity was going on, there was, all the time, the old under-current of perfectly legitimate trade criticism,

and Sir Dugald Clerk, so long associated with gas engines and gas engine research, was careful to explain, as he had done on innumerable occasions before, how wonderfully efficient gas was as a motive power and how hopelessly inefficient electricity was from the same point of view. This was largely—indeed, wholly—*ex parte* and delivered from a narrower point of view than that put forward by Sir Arthur Duckham, which was that in the national interest the best should be made of everything that was available, whereas from Sir Dugald Clerk's speech the uninitiated would rather infer that no good could come from electricity as a motive power. On the other hand, Mr. D. Brownlie—who had been speaking so often in the discussions on steam generation and allied subjects that he wound up by saying he must have been making himself a nuisance—expatiated on the hopeless inefficiency of gas as a medium for the generation of steam, and generally so decried the efficiency of gas that the gas advocates present could not restrain their righteous indignation. Actually, the meetings ought to have been thankful to Mr. Brownlie for dragging them out of the rut of dullness into which they often strayed.

Following this, there was a paper by Mr. E. W. L. Nicol on the use of coke for steam-raising purposes. Mr. Nicol is the expert to the London Coke Committee, and he has succeeded in getting his coke introduced into certain electricity generating stations with a considerable degree of success. The presentation of this paper led to a tilt at the use of pulverised coal, and Mr. Nicol—who was facetiously referred to later by Mr. Brownlie as the humourist of the gas industry—drew a picture of London in the near future becoming a second Pompeii buried under the ashes emitted from chimney stacks of power stations using pulverised fuel. He complimented the advocates of pulverised fuel on avoiding the necessity for removing the ashes by the simple expedient of blowing them out of the chimney, and assuming 25 per cent. of ash in pulverised fuel, he took the consumption of 10,000 tons of fuel per day in two super-stations in London, and promised the inhabitants a shower of 2,000 tons of ashes on their devoted heads during each succeeding 24 hours—a forecast which delighted those who would use nothing but gas as a means of steam raising.

Apart from this lighter side of the discussion, there was the more serious note touched that our attitude in the past in regarding coal as nothing but a material to be burned anyhow, was all wrong. Those who discussed the problem from this point of view brought it back into its proper perspective and re-introduced the need for the serious chemical and physical survey of our coals in order that the particular properties of particular varieties might be put to the most advantageous use.

As a wind-up to the discussion, Mr. Frank Jones held out the hope that before long something might be done to induce the colliery companies to send out their coal for the large industrial users in a form which was more pure than at present. The electrical industry, as was indicated by the I.M.E.A. Council's report last year, has been hammering at this question for some years, and it will be interested in this possible development. On the other hand, the hope may be more slender than appears at first sight, for Mr. Jones added that if some arrangement could not be come to with the colliery people in this respect, it would be necessary to put down cleaning plant at the points where the coal was used in order to remove the many tons of dirt which served no useful purpose either in a boiler furnace or a gas retort. In this event, of course, there still remains the grievance that the unfortunate buyer has to pay for this useless material, the cartage of it from the colliery, and the subsequent disposal of it.

In the afternoon, the Gas and Fuel Section continued its deliberations, and gave special attention to questions relating to low-temperature carbonisation and the use of pulverised fuel. As regards the former, it cannot be said that the subject was carried very far. It was admitted by practically everyone that we had not yet a practical economic low-temperature carbonisation process, although there were several in different parts of the world which seemed to have reached a critical point in that respect. The optimists, of course, were those who looked at the matter more from the practical side, whilst others—we will not call them pessimists by any means—were candid enough to say that there was no process at present, and that a good deal of further work was necessary. Even a delegate from Germany told the same tale, but it is interesting to know that Mr. Henry Ford is expending a sum of fifteen million dollars in developing a system of low-temperature carbonisation at the Walkerville works of his company in Canada with, however, the main object of making pulverised fuel.

The morning and afternoon proceedings were necessarily intertwined, and Dr. E. W. Smith—who is connected with the Woodhall-Duckham companies, which make gas-retorting machinery—said there could be no electrical industry unless there was co-ordination of fuel supplies and co-ordination between the gas and electrical industries. Mr. Brownlie put up a defence against the suggestion that we should be smothered in a very few years after the general adoption of pulverised fuel through the downpour of ashes, and, following on this, Dr. Lander (Director of Fuel Research) called attention to the fact that the gentleman who carried out certain tests in America in connection with the Lakeside power station at Chicago was present and might be asked to give some information on the matter of ashes from pulverised fuel plants. This gentleman was Mr. H. W. Brooks, who said there had been no trouble in any way with pulverised fuel plants in America, from the ash point of view, and that, although it had been stated in certain quarters that some plants had been removed, this did not appear to be the case. If they had been removed, they must have been replaced because, when he went to investigate the matter, the plants were working.

Power Stations and Transmission Lines.

During the afternoon of July 7th the discussion in Hall I on the subject of power transmission and distribution was continued, more especially with respect to power stations and transmission lines. Some 28 papers were considered, the chairman being M. Genissien (France).

Mr. C. H. Merz explained that in his paper he had attempted to survey the practice up-to-date and to indicate the directions of progress; it was most necessary to make cables for high pressure, and he looked forward to cables, connected directly to 130,000-volt overhead lines, being used to lead the supply into towns. How was all the auxiliary apparatus (switches, protective gear, &c.), which at present looked like representing the predominant cost of a system, going to be produced? More reliable cables would assist in that direction, and anything which would make the system more reliable was worth while. They must set their face against the purchase of apparatus on price considerations alone; cheap devices added to the complication of a system. He praised ironclad switchgear, mentioned the advantages of a standardised periodicity, and suggested that there should be one system only for both the general and railway suppliers.

Mr. W. S. Murray (United States) spoke about the Washington-Boston "Superpower" zone, remarking that to-day they could build single generators of 100,000 kW each and deliver power over 500 miles at a reasonable cost. When the scheme was planned, the maximum demand was estimated at four million kW, which would reach 10 million by 1930. The regional territory would be supplied at 110,000 volts, with feeders at 220,000 V or more, and the zones might be interconnected. Only 4 per cent. of the electricity used in the United States was sold by municipalities, the rest being provided by private enterprise under public control.

A Swedish delegate, on the subject of Government *v.* private enterprise, remarked that conditions differed in various countries, and in Sweden were rather special. Their Government scheme was the largest in the world,

and had to compete with their customers' steam plant and smaller water-power stations. Their transmission lines were built as cheaply as possible, and therefore the minimum of protection was provided; graded insulation had been adopted, but they never attempted to save money on their generators and transformers.

Mr. Bernard Price (South Africa) pointed out that the Victoria Falls undertaking had a very dense loading in a restricted area on the Rand; it was subject to exceedingly severe storms, and the switchgear, &c., was accordingly worked very hard. It would not have been possible to make the Rand system the success it was to-day without the balanced method of protection which he had invented. The cost of the pilot cables had been proved to be negligible, as compared with the results achieved. No other system had experienced such acute switching conditions as that on the Rand, and his opinion was that there was much scope for circuit-breaker development. Oil fires had been minimised by the provision of explosion boxes, but the rupturing guarantees of manufacturers were little more than guesswork. Designers were tackling the problem at the wrong end; instead of simply aiming at constructing a stronger switch, they should try to interrupt the arc properly and utilise the arc energy.

It was pointed out that few people appreciated the extent to which the use of automatic sub-stations had been adopted in America; automatic regulation of hydro-electric generating stations was also in use in those cases where the manual operating costs were high, one such plant having a capacity of 10,000 kW. The practice was extending because of the good results obtained, considerably more reliance being placed on automatic than on manual operation. All large generators in the United States were cooled on the closed ventilating system, and the experiments with hydrogen instead of air might lead to something in the future. Automatic voltage regulation was not so common in steam as in water-power plant, but its use would increase the stability of systems.

A Russian delegate briefly outlined the efforts being made to "electrify" his country, a paper on the subject having been submitted by the Conseil Electrotechnique Central, while Ing. S. Tolkatscheff described the State generating stations now under construction in the Socialist Soviet Republic.

The continuity and regularity of operation of large electrical systems was dealt with by Ing. Guido Semenza, who outlined in the paper the causes of bad service in Italy. Some of them, he stated, could be eliminated at a cost, while he complained of the use of too cheap machinery on the Continent. A United States delegate, in discussing the "superpower" project, which he described as merely normal development, thought there was a danger of the public being biased against a scheme which was given a name that might suggest the growth of the octopus.

A Canadian stated that 97 per cent. of the power produced in Canada was hydro-electric; the largest plant had 10 sets of 60,000 kW each, which were made possible by the modern thrust bearing and efficient cement-lined waterways. A turbine efficiency of 93.6 per cent. was now obtained with an electrical efficiency of 91 per cent. at the switchboard. Systems were becoming so large that it was necessary to design the component gear so that it would resist the stress which might be imposed on it as a result of a failure of part of the whole, because continuity of service was essential. The use of relays restricted the one or two interruptions caused by lightning per year to small parts of the system; in some cases automatic generating stations might be adopted, but they would not take the place of interconnected hand-operated plant. Public ownership on the Canadian lines would give the best financial results.

Several papers originated in Holland, in one of which a new station was described, which was to use a high steam pressure and temperature, all the auxiliaries being electrically driven, for which the calculated efficiency was 26 per cent., and an overall efficiency of 20 per cent. might be expected.

List of Papers.

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SECTION H.—*continued.*

POWER IN INDUSTRY.

267. The Use of Town's Gas in Industry: Sir Arthur Duckham, K.C.B., M.Inst.C.E. (Great Britain).
270. Latest Developments in the Use of Electricity for Heating Purposes in General and especially for Domestic Purposes: Dr. W. Lulofs (Holland).
271. Electric Power in Norwegian Households: J. Sandberg (Norway).
272. Electricity Rates in Norway: Joh. A. Haga (Norway).
274. Power in the Iron and Steel Industry in America: Barton R. Shover, F.A.I.E.E. (U.S.A.).
276. Application of Power to Paper Making in the United States: A. H. White (U.S.A.).
277. Utilisation of Electric Power in Bulawayo and District, Rhodesia: B. K. Ward (Southern Rhodesia).
278. Development of the Use of Power in Southern Rhodesia for Industrial and Domestic Purposes, with Particular Reference to Electric Power: G. H. Baskerville (Southern Rhodesia).
279. Application of Electric Power in German Industry: Dr. Carl Köttgen (Germany).
280. Power for Textile Mills: Charles T. Main (U.S.A.).
281. Electricity in Agriculture: Dr. H. Wallem (Germany).
282. Electricity Supply of the City and Peninsula of Bergen: Asbj. Bjerke and E. Monsen (Norway).
283. Electricity Supply of the City of Kristiania: R. Steen (Norway).
284. Electricity in Agriculture: Nils Ekwall, C.I. (Sweden).
285. L'Electricité dans les ménages et dans l'agriculture: O. Ganguillet (Switzerland).
286. Present Situation of Electrical Undertakings in Japan: M. Shibusawa (Japan).

SECTION J

POWER IN ELECTRO-CHEMISTRY AND ELECTRO-METALLURGY.

291. The Austrian Electro-Chemical Industry (with an Appendix upon the New Institute for Technical Electro-Chemistry at the Technical College, Vienna): Dr. Heinrich Paweck (Austria).
292. Electrolytic Iron: T. W. S. Hutchins (Great Britain).
294. Electro-Metallurgy in Italy: Dr. F. Giolitti (Italy).
295. Nitrogen Fixation: Dr. B. F. Halvorsen (Norway).
296. The Electro-Chemical Industry in Sweden: Prof. W. Palmer (Sweden).
297. A New Resistance Furnace with Reaction Zone: Torsten Holmgren (Sweden).
298. Power in Electro-Chemical and Electro-Thermal Industries: F. A. J. Fitzgerald, M.A.I.E.E. (U.S.A.).
299. Power in Electro-Metallurgy in the United States: E. P. Mathewson, M.A.I.M.M.E. (U.S.A.).
300. Electrical Engineering as a Leading Factor in the Development of Modern Steel Works: W. Geyer (Germany).
301. Small Water Powers and Electro-Thermal and Electro-Chemical Loads: G. Boex (Great Britain).

SECTIONS K 1, 2, AND 3

POWER FOR TRANSPORT.

K1

273. Power Saving through Anti-friction Bearings: Uno Forsberg (Sweden).
311. The Electrification of the Austrian Federal Railways: Ministerialrat Dr. Ing. Arthur Hruschka (Austria).
312. Electrification of Railways in the Dutch East Indies: Dr. G. De Gelder (Dutch East Indies).
313. Application of Power to Rail Transport: Roger T. Smith (Great Britain).
326. Some Considerations on the Development of Railways and Tramway Traction: Prof. Ir. I. Franco (Holland).
328. Electric Traction in Italy: Prof. F. Tajani (Italy).
329. Electrification of Railways in Norway: H. J. Schreiner (Norway).
330. Power Problems of the Swedish Railways: I. Olverholm (Sweden).
331. Power Questions relating to Swedish Tramways: A. Hultquist (Sweden).
332. Power for Ship Propulsion: H. G. Hammar (Sweden).
333. The Reversing-clutch Marine Turbine: O. A. Wilberg (Sweden).
334. Railroad Electrification: Bion J. Arnold (U.S.A.).
336. Main Line Electrification on the State Railways in Germany: Wilhelm Wechmann (Germany).
337. The Frequency Converter: Prof. Dr. Paul Müller (Germany).
339. Variable Transmission Gears: Dr. H. S. Hele-Shaw, F.R.S., M.Inst.C..E. (Great Britain).
340. The Internal Combustion Engine for Transportation: Charles Edward Lucke (U.S.A.).
341. Testing Locomotives on the Great Western Railway: C. B. Collett (Great Britain).
343. The Financial Aspects of Main Line Electrification: Sir Philip Dawson, M.P. (Great Britain).

K2

315. Shipowners and Shipbuilders: The Rt. Hon. Viscount Inchcape, G.C.M.G., G.C.S.I., K.C.I.E. (Great Britain).
316. Sail—Its Early History and Later Development: Basil Lubbock (Great Britain).
317. Steam and the Measurement of Power for Sea Transport: Hector C. Bywater (Great Britain).
318. Hull Resistance and Power for Propulsion: G. S. Baker (Great Britain).
319. Sea Speeds and their Costs: Alexander Gray (Great Britain).
320. Fuels and their Supply for Sea Transport: F. J. Leathers (Great Britain).
321. The Development and Present Position of the Motor Ship: A. P. Chalkley (Great Britain).
322. The Four-cycle Type of Diesel Engine for Motor Ships: Contributed (Great Britain).
323. Two-cycle Diesel Engines: Robert Traill (Great Britain).
324. Diesel Auxiliary Machinery in Connection with Marine Propulsion: Richard W. Allen, C.B.E., M.Inst.C.E. (Great Britain).
325. Electric Transmission of Power for Propelling Machinery: W. J. Belsey (Great Britain).
327. General Data on the Propulsion of Ocean-going Ships in Holland: W. J. Muller (Holland).
335. Present Practice as regards Application of Power for Marine Purposes in America: William T. Donnelly (U.S.A.).
344. Electric Ship Propulsion: Commander Robinson, U.S.N. (U.S.A.).

K3

176. Internal Combustion Engines for Motor Transport and Aviation: G. Agnelli (Italy).
314. Power applied to Road Transport: R. E. Crompton (Great Britain).
338. Application of Power to Air Transport: Alec Ogilvie (Great Britain).
342. The Influence of Road Conditions on the Development of the Internal Combustion Engine as the Unit of Power in the Modern Motor Car: H. G. Burford (Great Britain).

SECTION L

POWER FOR ILLUMINATION.

351. Progress in Electrical Illumination: C. W. Sully (Great Britain).
352. The National and International (Aspects) of Illuminating Engineering: Leon Gaster (Great Britain).
353. International Co-ordination in Illumination: J. W. T. Walsh, M.A., M.Sc. (Great Britain).
355. Some Modern Points of View concerning the Construction of Electric Incandescent Lamps: Dr. Ing. Halbertsma (Holland).

(*To be continued.*)

A Village Hydro-Electric Installation.

The Brodick, Arran, N.B., Plant.

By WILLIAM HARROWER, Graduate I.E.E.

In order to light electrically certain buildings on his Arran, N.B., estate, a hydro-electric generating station was installed some 15 years ago to the order of the Marquis of Graham, C.B.; the plant was designed by Mr. H. McCuffie, M.I.E.E., of Glasgow (the contractors being Messrs. Lowdon Brothers, also of Glasgow). It consists of a 60-h.p. Pelton wheel coupled through a clutch to a 35-kW d.c. generator, giving a pressure of 260 volts (fig. 3). The other side of the Pelton wheel is also coupled through a clutch to a countershaft which drives the sawmill and joiner's shop. The purpose of the clutches on either side of the wheel is that when light is not required, the power can be used for driving the sawmill.

Fig. 1.—Power Station and Terminal Pole.

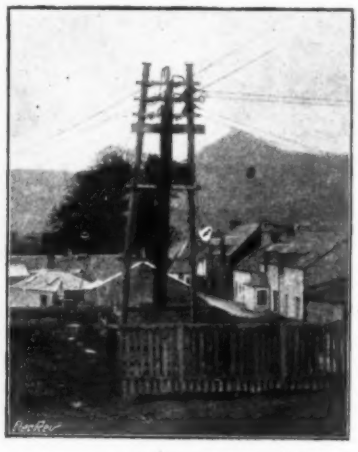


Fig. 2.—Sub-station and Transmission Line Pole.

The water supply is taken from a reservoir, the site of which is north of Brodick Castle and 670 ft. above the level of the power station. From the reservoir, which is 1,450 yards from the power station, there is run a 7-in. pipe line through the necessary valves direct to the Pelton wheel. As no storage battery was provided at the start, light was supplied direct from the generator, and at that period the light was installed at Brodick Castle, the estate offices, stables, and workshops only, the total installation consisting of 550 16-c.p. lamps.

The Pelton wheel, made by Messrs. Carrick and Ritchie, of Edinburgh, has given every satisfaction. A little trouble has been caused by the joints of the pipe line blowing out now and again, but they are easily re-jointed. The writer had occasion five years ago to put an extra valve in the pipe line, and when the pipe was cut, the inside was found to be in perfect condition. The cost of running this plant has been very low, considering that it has been working for an average of 15 hours per day for nearly twelve years.

In 1919 the author, who was present at the erection of the plant, was instructed to prepare a scheme for lighting the village of Brodick without altering the existing arrangement, if possible. After careful consideration it was found advisable to install a battery, fig. 4, and booster, also a new switchboard, using most of the material of the old switchboard. The battery decided upon was one of the Hart N.L. 25-plate, 137-cell type, having a capacity of 640 amp.-hr., the booster being made by Messrs. Newtons, Taunton, and having an output of 100 amps. at a pressure of 100 volts; it is belt-driven from the generator, which is provided with an extended armature shaft (fig. 3). The switchboard was supplied by Messrs. A. Chalmers & Mitchell, of Anderston, Glasgow, and is of white marble, made up in eight panels mounted on angle-iron frames, fig. 5. The main switches are of the d.p. change-over type, so that light can be supplied either from the battery or direct from the generator, as required. There are also six circuit d.p. switches and fuses, complete with all the necessary meters for the proper control of the plant.

As the village is a mile and a half from the power station and not very compact, it was found advisable to erect a small sub-station in the village, fig. 2, and to divide the wiring into four circuits. The wiring is all overhead from the power station to the village. In private ground the wire is bare stranded copper, but in public ground and also in the village the wires are single braided and compounded. The mains to the village are 37/.093 gauge, erected on larch poles grown on the estate, placed about fifty yards apart and fully protected by lightning arresters.

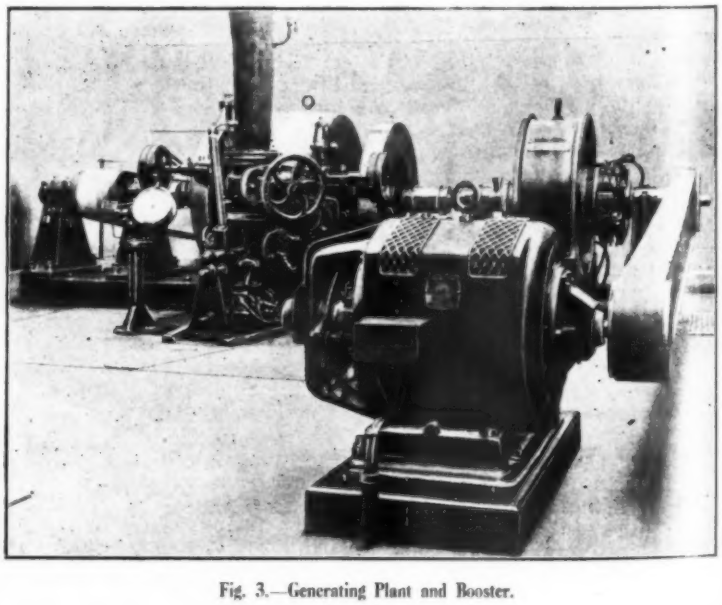


Fig. 3.—Generating Plant and Booster.

There are seven motors connected to the supply and about 1,500 lamps. The motors vary in size from 1½ to 15 h.p., but the larger motors are only run during the day when practically no lighting is required.

During the past year 19,000 kWh was consumed. The charge for lighting is 1s., and for power 6d. per

kWh, which is not excessive for a small village. As the present plant will not suffice to supply the demand in another year or so, arrangements are being made to increase both the plant and also the pressure from 240, as at present in the village, to 480 volts.

Last year the writer installed a petrol-paraffin plant as a stand-by in the event of a breakdown at any time of the present water plant. The engine is of 60 h.p., was made by Messrs. Parsons, Ltd., of Southampton, and is coupled direct to a 100-amp., 260/360-volt, compound-wound generator made by Messrs. Crompton, of Chelmsford, the switchboard having been supplied by

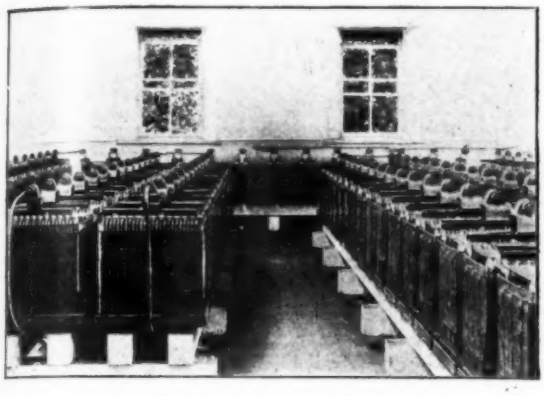


Fig. 4.—Portion of Battery Room.

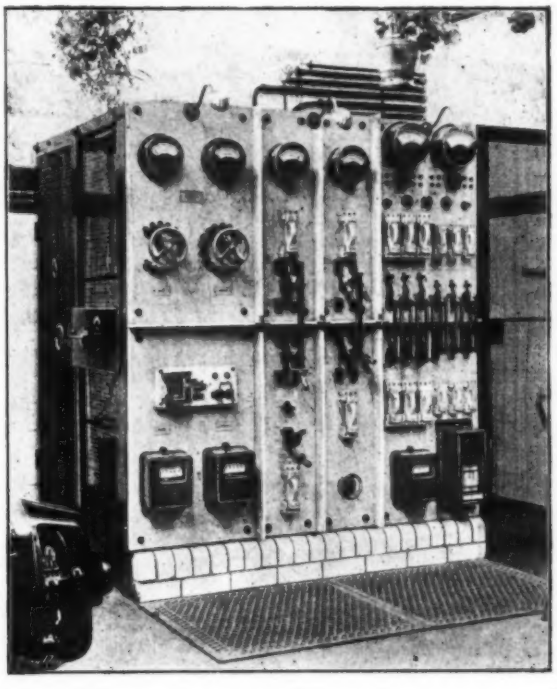


Fig. 5.—Main Switchboard.

Messrs. W. McGeoch & Co., of Glasgow. It is of polished slate mounted on an angle-iron frame, complete with all the necessary instruments. This plant has never been required except when the water plant was being overhauled, as there is always a good supply of water even in the driest season.

Notes on Electric Lifts.

By S. L.

In perhaps no other branch of engineering is there such a scarcity of literature as in that which is devoted to the subject of electric lifts for passengers and goods. This fact seems somewhat surprising, when we consider the important position of the electric lift in the modern development of schemes for the handling of goods and passenger traffic. Curiously, too, Governmental printed matter is very meagre indeed, as with the possible exceptions of a safety pamphlet, and a leaflet or two on this subject, nothing has been published since the Blue Book "Report on Hoists, &c.," by W. S. Smith, in 1904.

The manufacturers of electric lifts, of course, cannot perhaps be expected to give too much away, but informative matter of a practical character on such an important subject would seem to be productive of good rather than of possible harm to the maker's interests, since its ultimate effect is bound to be educational to the ordinary engineer, who is naturally outside the pale of the lift specialist class, so to speak. Further, it is a remarkable fact full of significance for the observant that the average "practical engineer" possesses but little knowledge of lift engineering matters. Were proof needed to support this rather blunt statement it would not be at all difficult to illustrate the point in a simple yet telling manner. It is a common and almost everyday occurrence to find in works of all kinds a coincidence of breakdowns of machinery; for example, say, one will be a failure of a 100-h.p. motor, the other a 20-cwt. lift employing a 15-h.p. motor. Whereas the 100-h.p. motor and its transmission gear too will, in the majority of cases, be dealt with entirely by the works' staff on the spot more or less expeditiously, the lift makers or maintenance firm will be called in to attend to the defective lift in most cases, and almost certainly if the lifting ropes require renewal. Such lack of resources must inevitably handicap the operation of a works or factory, and it is conceivable in an emergency that such an absence of self support is apt to set up complications which may have far-reaching and serious results in other directions.

The question of safety is undoubtedly of supreme importance, and that this is recognised is well shown in the official slogan of "safety first," so common an industrial watchword with us of to-day. In this respect one cannot have failed to notice the somewhat increasing frequency in the number of serious lift accidents—often fatal—that have occurred within recent months. This fact is rather disturbing, since in many cases it was elicited that the primary causes of the accidents referred to were of simple origin, preventable by suitable safety appliances, and the inference would seem, therefore, to be justified that the dangers inseparable from the operation of lifting and hoisting machinery were not appreciated by the owners or persons using them.

There seems indeed at the present time to be a rather prevalent idea that, generally speaking, the equipment of power-driven lifts and hoists is as near engineering perfection as it is possible to render such complicated mechanism in the way of satisfactory service, and comparative immunity from accidents. No doubt as regards the electrically-driven lift the application of automatic interlocking safety devices, in conjunction with efficient gates or doors to the car and landings to floors or other openings, has largely contributed towards the evolution of the modern electric lift combining safety with efficiency. Designed with highly-efficient driving gear of the worm-wheel automatically lubricated type possessing self-sustaining properties, and thus obviating the possibility of the load taking charge and driving backward, these qualities, together with the incorpora-

tion of safety gear to prevent the car from falling in the event of excessive overloading or failure of the suspension ropes, are all important factors which go towards the making of the successful electric lift which has attained such a high standard of dependability to-day.

Notwithstanding the provision of otherwise adequate safety appliances, accidents, however, will and as a fact do not infrequently happen, but in common fairness it must be granted that failures directly due to inherent defects in electro-mechanical safety appliances are comparatively rare; such accidents as occur commonly arise through the effects of misuse, neglect, &c. Unfortunately, it is not always possible to render such mechanism absolutely foolproof or immune against careless handling. It is, or should be, pretty common engineering knowledge that efficient inspection and maintenance are the sure remedy for a faulty condition, and the regular provision of such essential service might not inaptly be termed the keystone of safe and satisfactory lift operation. Drastic treatment of offenders will almost invariably act as a strong deterrent against wrongful interference with lift equipment.

The majority of lift accidents as shown by the official returns are due to: (1) persons falling down the lift shaft; (2) persons being trapped or crushed between the car and the sides or walls of the lift shaft, or at the top and bottom of the shaft. Accidents directly due to breakage of the suspension ropes are, fortunately, comparatively rare. Falls down lift shafts would be impossible if the entrances on every landing or other openings were provided with efficient doors or gates of the automatically interlocked type and if these were properly maintained.

In the official returns for the year 1922, the total number of lift and hoist accidents is given as 343, of these 23 being fatal. This shows an increase on the total for the year 1921, when the reported accidents totalled 320; of this number 25 were fatal. The returns which are quoted for the year 1922 are the latest figures published to date, the Annual Report of the Chief Inspector of Factories and Workshops for 1923, not being available at the time. The foregoing figures do not, of course, include accidents due to cranes and other lifting gear, which are much more numerous.

Quoting from the tabulated *total* returns of accidents for the year 1922, these may be briefly classified for the purpose of comparison as follows:

Causation	{	Crushes (various), 43 per cent. approx.
		Falls (various), 29 per cent. approx.
		Miscellaneous, 28 per cent. approx.

Included in the above the total number of accidents through the breaking of suspension ropes is stated as 16 (one fatal); and it is interesting to note the comparatively low percentage of accidents due to suspension rope failures, which works out at slightly over 4.5 per cent.

It seems a somewhat curious anomaly that whilst the statutory rules and regulations for the use of electricity, and the various legal measures taken to safeguard life and limb in most, if not in all industrial processes, are most comprehensive, yet the law as it affects the installation and working of lifts and hoists is very indefinite. The Home Office, usually more than ordinarily prolific in issuing publications, seems to have almost overlooked this subject, as the literature available is very meagre indeed, and although an excellent memorandum on chains for lifting was published by the Home Office in 1915, nothing so far appears to have been published on the subject of wire and other ropes for lifting purposes. Even in the Blue Book by Mr. W. S. Smith, referred to earlier in this article, most of the matter is now out of date, and for all practical purposes this work is really of historical interest only. It is, however, deplorable to find, as showing a lack of definite regulations regarding safety appliances, that so-called "safety devices" which were rightly condemned in the 1904 Report above referred to, are still to be seen in fairly extensive use to this day, and examples of such dangerous and obsolete "contraptions" may be found in many warehouses and factories, openly and mockingly defying the official dictum even twenty years after.

In the words of the Home Office Factory Department, it is *recommended* (italics are the writer's) *inter alia*, that: Suspension ropes and chains should be periodically inspected at reasonably frequent intervals by a competent person.

Any rope or chain showing a defect should be discarded at once.

A brake should be provided on the winding gear capable of sustaining the cage when fully loaded. The cage "stops" should be examined from time to time.

No entrance should be allowed on the side of the cage on which the balance weight works.

Each doorway should be constructed so that (*a*) It cannot be opened until the cage is at rest at the required floor.

(*b*) The cage cannot be moved away until the door or gate is closed and fastened.

Adequate lighting should be provided in the cage and all approaches and entrances to the hoist. The words "Hoist—Danger" should be clearly marked at, or near, the hoist doors or gates at each landing, and should be visible whether the doors or gates are closed or open.

Bars or chains across doorways or loading openings do not afford efficient fencing.

The maximum safe load should be clearly marked on the inside of the cage, and on the hoist doors. A competent person should be placed in charge to operate a hoist.

Safety-gear should be provided to prevent the cage falling in the event of failure of the suspension ropes, or serious overloading.

Of course, nobody would ever seriously question the wisdom of such efforts for the promotion of safety, and in the writer's opinion the official recommendations quoted above deserve far wider publicity, but it must be remembered that, laudable though they undoubtedly are, these precepts are in the nature of recommendations only, and as such, as human nature goes, must be rendered largely futile, or at any rate be considerably handicapped in their effects for good for the obvious reason that, since the present state of the law in this direction is so very indefinite, no statutory obligation is imposed on the owner of a lift, or hoist to carry out such recommendations. Hence we find that the adoption of safety appliances, &c., is not always considered until after a serious accident occurs, and as one result, the necessary pressure is then brought to bear through a coroner's comments or the intervention of H.M. Factory Inspector. At several recent judicial inquiries into lift accidents, strong recommendations have been made for the fitting of safety appliances; for instance, not so very long ago the Manchester City Coroner is reported to have remarked, in the course of an inquiry, that he hoped the day would come when all lifts in Manchester would be fitted with automatic gates.

In this conection the writer can vouch for cases where the lift owner has stated his refusal to consider the fitting of necessary safety appliances unless definitely ordered to do so by H.M. Factory Inspector. Cleverly evasive, such an owner knows well that the factory inspector would find it extremely difficult to compel him to do anything worth bothering about.

The conventional lattice or collapsible gate made of light bar metal of the Bostwick pattern has, owing in a large measure to its extreme mobility and adaptability to the incorporation of interlocking gear, come to be regarded as a sort of standard gate fitting for both lift cars and floor landings. Although there are very many otherwise excellent types of automatically-controlled gates in use, in not a few of these numerous important details might with decided advantage be greatly improved on the score of safety alone. For instance, in the type of lattice gate referred to, electro-mechanical interlocking gear is often located in such a casual manner as to be easily interfered with by simply inserting the hand through the bars of the gate, and serious accidents have resulted from mischievous meddling with

such ill-disposed fittings. Then there are car and landing gates fitted with locking gear operated by hand-keys of a special pattern (safety keys?), which can be opened equally well by any odd bit of wire or even a stump of lead pencil, which abound on a large number of otherwise satisfactory passenger lifts; this sort of an apology for a safety-lock has been responsible for many serious accidents. It would seem that such fittings possess a kind of fascination for the attentions of the *genus* warehouse and office boy. Many minor accidents are due to badly-designed or defective gate and door handles, grips, and the like, which cause trapped hands when opening or closing the gates. Faulty gates and their guides sometimes are the cause of crushed feet, and occasionally trapped clothing leads to more serious mishaps. Passenger cars fitted with lattice or similar gates, especially when two entrance gates are provided, should always be arranged so that it is an impossibility for a person to insert either hand or foot through the gates at any point. If at all possible, such gates should be made of the same size so as to correspond with the full opening; open spaces above the tops of both car and landing gates or doors are a source of danger, and should never be permitted; if it is not practicable to fit gates or doors of the same size as the openings, then the spaces should be suitably enclosed for safety. Gates and doors of a less height than 6 ft. are obviously a source of danger, as are also projections inside the lift shaft; where projections cannot possibly be avoided, then efficient means should be taken to render these comparatively safe by the fitting of "slope" boards or similar expedients.

So-called automatic stops or limits are usually provided for the purpose of arresting the car at its highest and lowest points of travel. Such stops and their knock-off gear, tappets, &c., for preventing overshooting the terminal floors, have a tendency sometimes to work out of proper adjustment, and the actuating ropes thereto, usually of small gauge wire cable, are quickly affected by damp and rust and frequently break; the knock-off switch then fails to act at the psychological moment, or the stops may have been intentionally set too high by an ignorant attendant, foolish-like, possibly to save himself the trouble of climbing on to an awkward place to reset the switch after carelessly overrunning the car. Commonly, car switches, limits, gate interlocks, tappet gear, &c., are apt to fail to function properly; this may arise from various quite simple mechanical causes, as rusted bearing surfaces, bent tappet levers, broken tappet friction pulleys, and rubber rollers or bands, to say nothing of the effects of simple yet vital details as bolts and screws having got broken or worked adrift. The usual faults met with in car switches, electric-gate locks, tappet switches, &c., arise from faulty insulation. In many cases this is inherent in the design itself, and far too much reliance seems to be placed on a few mils thickness of micanite. Gate and door switches generally are designed on far too conservative lines, with the result that the interior is often a tightly-packed mass of live metal parts, springs, plungers, bolts, &c., with insulation of the varnished paper variety. The wiring up of such fittings is no small job, while a repair of any consequence calls for more than ordinary skill and patience. Externally, these switches may present a neat, clean appearance, with an artistic monogram indicating their origin.

In the car itself, where fitted with hand-switch control, the operating handle is commonly of the lever non-interlocking type, and rarely indeed does one come across an attendant who will take the necessary precaution to remove the switch handle on leaving his car. Some patterns of lever handle are apt to operate involuntarily without being touched by hand, and thus cause the lift to be set in motion. A fatal accident occurred not so very long ago through a person accidentally falling against a car switch handle which had been left in position unattended. In a properly-designed car switch it should be impossible to leave the operating handle in its working position by itself; further, the withdrawal of the handle should render the switch absolutely inoperative by any means other than its own handle or key. With fully-automatic or semi-automatically controlled electric lifts of the so-called push-button type (where no attendant is the general practice almost), it might truly be said that "eternal vigilance is the price of safety." Periodic inspection at frequent intervals should be carried out on the whole of the main and auxiliary control and automatic interlocking gear; especially should close attention be given to the condition of the wiring and particularly at points of entry into fittings, switches, &c.; short circuits and earth faults are often of quite trivial origin, and may in most cases be easily detected and remedied by properly testing and repairing. By such timely measures serious accidents may be avoided. The types of lift referred to are common in office premises, warehouses, hotels, restaurants, &c.

(To be concluded.)

The Miners' Lamps Committee.

Final Report *(Abstract)*.

THE Mines Department has issued the final report of the Miners' Lamps Committee (Memorandum No. 11; H.M. Stationery Office, price 9d. net), which was originally appointed by the Home Secretary in 1919 and was re-appointed in January, 1921, by the Secretary for Mines to report on (*a*) what improvements are possible in miners' lamps as regards safety and illumination, and what alterations are desirable in the present methods of testing and approving such lamps; (*b*) whether the present arrangements for maintaining such lamps in a safe and efficient condition at the mines are adequate; and (*c*) what steps should be taken to safeguard the general use by the workmen in a mine of safety lamps which give no indication of inflammable or noxious gases. The previous publications of the Committee are 10 in number; the final report deals with both flame and electric lamps, and points out that the use of the latter type has rapidly increased, as the following statistics show:—

Year.	Number of electric lamps in use.
1912	10,727
1914	75,707
1916	126,784
1918	156,521
1920	245,900
1922	294,593
1923	327,929

Even the best of them meet the requirements for approval with difficulty when at their highest pitch of efficiency, and the latest types submitted have not disclosed any marked progress in design. The Committee outlines the desiderata for a hand-lamp, and indicates the lines along which progress appears to be possible.

Safety.

In itself the electric lamp is undoubtedly a safer form of illumination in a coal-mine than is a flame-lamp; the three possible dangers directly attending its use are all of them remote, the possibility of an ignition of firedamp being caused through the accidental fracture of the bulb (and of the stout outer glass that protects it) exposing the glowing filament has been the subject of experiments made by Mr. W. C. F. Shepherd, an account of which is given in the appendix to the report. Nevertheless, the provision of means whereby the electric circuit is opened as soon as the outer protecting glass is fractured, is a wise precaution.

Faulty electrical contacts in a miners' hand lamp are most frequently due to lack of cleanliness in the lamp-room. Of the three methods employed to obtain pressure between the terminals of the battery and the metallic segments in the contact-plate, either the use of the lead terminals unadorned or with coiled springs and brass studs attached to them appears on the whole the most satisfactory. In this connection a lamp in which the contacts are established when the lamp is locked and cannot be designedly broken until it is unlocked, possesses advantages. Probably the most faulty bulb holder, by working loose during service, is the screw type. From experiments it would appear that the highest efficiency, in the ordinary

course of manufacture, that can be expected from a 2-volt bulb of reasonably long life (say, 500 burning hours) is 1.7 watts per candle; meaning that 1.0 c.p. will be given by a 2-volt bulb having a consumption of 0.85 ampere.

Although an electric lamp can be built so strongly that it will not disclose any obvious mechanical damage through the roughest of usage, it has two tender spots, the filament of the bulb and the positive plates of the accumulator, which rapidly deteriorate. The provision of rubber pads at the giving-in windows of the lamp room, so that the lamps are saved the jolt consequent on being set down hurriedly on a hard surface, greatly increases the average life of the bulb. A bulb filament is less sensitive to shock whilst it is incandescent, and therefore it is preferable that the lamps should be returned to the lamp-room whilst still alight.

In general, consideration of the fact that the vital parts of a miner's electric lamp are not, and cannot be made, robust, causes the Committee to regard the tendency exhibited by lamp-makers to construct stronger (and heavier) lamp-cases, in an endeavour to combat rough usage, as a mistaken policy; rather the lamps should be made apparently fragile, and of a character demanding careful handling.

Light-giving Power.

An electric hand lamp with a 2-volt acid or a 2.5-volt alkaline accumulator usually weighs between six and seven pounds (the accumulator alone weighing about four pounds), and the Committee received little encouragement to its suggestion that the miner might be prepared to accept a heavier lamp if he could obtain a brighter light from it. Nevertheless, there are material advantages to be obtained by making an important increase in the magnitude of the source of light, *i.e.*, by increasing it four- or five-fold for example. On the whole, the Committee does not think that much improvement is possible, so far as their capacity is concerned, in the present methods of construction of secondary batteries of a given size and weight, whether acid or alkaline, when the necessity for general reliability is considered.

Trials of bulbs of different current consumptions seem to show an advantage as regards candle-power in a bulb that has a current consumption of 1.20 amperes, as compared with 0.85 or 1.0 ampere; but it is slight and is discounted by a shorter life and by the consideration that the battery to supply such a bulb must have a high capacity. The trials revealed a remarkable disparity between the qualities of 2-volt bulbs made to the same specification by different lamp makers. The best results are given by bulbs having a current consumption of from 0.95 to 1.0 ampere, which should give from 1.15 to 1.25 candles at 2.0 volts, with a reasonably long life. The trials confirm the opinion (expressed in Memorandum No. 3) that the supply of important renewal parts of miners' lamps should be subjected to close control to ensure that the same make and quality of fitting shall be used as was included in the examples submitted for official approval. Such control can best be exercised by the lamp maker to whom the maintenance of his type of lamp in an efficient condition is of paramount importance, and who possesses the facilities for testing and gauging all renewal parts that pass through his works.

In practice the candle-power rarely exceeds one at the beginning of the shift and may fall normally to as low as 0.75 candle by the end of it. "Pillarless" lamps are to be recommended; "cap-lamps" in this country do not seem to be generally acceptable amongst the miners, although they appeal to the Nystagmus Committee of the Medical Research Council, which wishes to encourage their use.

No doubt the most satisfactory means of preventing an unserviceable type of lamp from becoming "approved" would be to stipulate that a number of samples should undergo a reliability test in actual use underground for, say, six months before approval is confirmed. The Committee has found the principle of prolonged practical trial invariably profitable, and it recommends its official adoption. The Committee is satisfied that considerable pains are taken by the lamp manufacturers to ensure that the integral parts of their lamps as supplied for renewal purposes correspond closely in design and quality with the samples submitted for official test and preserved for registration purposes. An electric lamp that is liable to fail suddenly in use through some imperfection of its parts is a menace in a coal-mine, apart from the direct danger that sometimes arises from imperfect fittings.

Future Developments.

There does not seem much likelihood of improvement, unless a substantial increase in weight is conceded, in the 2-volt miners' electric lamp as regards its light-giving powers. The best chances of development seem to lie in providing for an improved distribution of the light, such as is given by pillarless lamps and in those fitted with outer glasses of the "Holophane" type; or it is possible that the difficulties that are at present experienced in constructing 4-volt batteries of suitable size and weight may be overcome and the use of gasfilled bulbs of high candle-power thus rendered possible. Supposing, however, that schemes for universal lighting at the face are considered, there are several directions in which development is possible. Any scheme of universal lighting, and indeed lighting by hand-lamps also, would be greatly aided were the surface to be illuminated white instead of black. Much more can be done underground than is at present attempted by way of whitewashing, and any such attempts would be most beneficial to the eyes of the miner. There should be developments as regards the provision of means for testing for gas, or for giving warning of its presence, as an adjunct to the electric lamp, and researches to this end are in progress.

The Association of Mining Electrical Engineers.

Steam *versus* Electricity in Colliery Practice.

(*Abstract of Presidential Address by* Mr. George Raw.)

From a purely engineering point of view the ideal plant equipment of a colliery is undoubtedly that of total electrification, preferably with power from an outside source of supply, subject to the use of adequate emergency arrangements to provide against a total failure of supply. Have we, however, reached such a stage that the modern colliery can with advantage consign its steam plant to the limbo of the past?

In examining this question we may place such items as haulage, pumping, and screening plant drives and other auxiliaries beyond the pale of controversy. If a power supply is available on anything approaching economic terms, the advantage of driving these electrically is so great, no matter whether the current is supplied from an outside source or generated at the colliery, that we may dismiss it from further consideration in this connection. In the case, however, of (*a*) winding, and (*b*) air compressing and ventilating, which items represent the major portion of a colliery's motive power requirements, the position is different.

In the following figures I have endeavoured to make out the poorest case possible for the steaming of these units.

In a modern colliery boiler plant the cost of raising one ton of steam cannot well be taken as exceeding 4s. (assuming the cost of coal of 12,000 B.th.u. to be 20s. per ton at the colliery, and allowing 12½ per cent. on outlay to cover interest and depreciation.

Sixty lb. of superheated steam of 120-150 lb. pressure per shaft h.p.-hour cannot be considered low as an overall figure covering the seven days of the week for a properly designed non-condensing winding engine. Correspondingly, for a similar winding duty, electrically performed, a consumption of not less than 1¼ kWh may be assumed per shaft h.p.-hour.

A factor useful for purposes of comparison which we call the "equivalent steam factor" may be expressed as the pounds of steam required by a steam engine to do the work which 1 kW of electrical energy in a motor would perform on the same duty.

The equivalent steam factor in the case of the winding engine therefore would be 60 lb. steam/1¼ kWh=40 lb. steam per kWh.

For air compressing and ventilating we may assume an overall steam consumption of 20 lb. per i.h.p.-hour for properly designed condensing engines, which figure, however, cannot be regarded as other than high. This represents an equivalent steam factor of 27 lb. of steam per kWh.

A proportion which may be assumed of the total steam consumption for these major items of plant would be (*a*) 40 per cent. for winding and (*b*) 60 per cent. for compressing and ventilating. An overall equivalent steam factor is arrived at on the basis of this proportion of 32 lb. of steam per kWh in driving the winding, compressing, and ventilating plant.

One ton of steam at the colliery steam plant becomes equivalent therefore on this consumption to 70 kWh, the price of which, with steam at 4s. per ton, amounts to 0.68, or, say, 0.70 of a penny per unit. In consequence energy purchased at 0.70 of a penny per unit would be equivalent to the cost of steam.

These figures constitute, I believe, the poorest case that can be responsibly submitted for modern steam practice. Since the foregoing is based upon a price of 20s. for coal of 12,000 B.th.u. at the colliery, the public utility supply concerns would be compelled to add to this price under their coal clauses, the cost of transport, while they would have to deliver to the colliery current at the consuming pressure without any allowance for transformer or power-factor losses, at the overall price of 0.70 of a penny per unit.

That the public vendor of electrical energy would be able ultimately to compete on such a basis I have little doubt. He is making very effective progress with steam economy, and will doubtless in future years in greater measure bring to his assistance such factors as water power in addition to

cheap heat from coking, blast-furnace, and other plant. Meanwhile, however, can a colliery with modern or modernised plant, assuming 12,000 B.th.u. coal at a price of 20s., be content with an overall equivalent electrical price for the larger units of plant of 0.70 of a penny per kWh?

My own answer is unhesitatingly in the negative, for several reasons:—(*a*) A large colliery will frequently have low-grade fuel available of, say, 9 to 10,000 B.th.u., at a market value of not more than 10s. per ton at the colliery or considerably less. (*b*) The exhaust from winding engines cannot be allowed to blow to atmosphere. (*c*) The figures assumed present, as stated, the poorest possible case for steam in a modern plant.

I should, in consequence, in many cases expect the foregoing equivalent overall electrical price to come down to between 0.3d. and 0.4d. per kWh, and in some cases under that.

I fully expect further early and responsible developments in colliery steam practice in the use of steam up to 250 lb. pressure as in locomotive work, suitably superheated and exhausting in the case of the winders to turbo-alternators at absolute pressures of probably from 30 to 40 lb.

I have not referred to electrical generating at individual collieries for the reason that, if the foregoing conclusions carry conviction, the case against the individual generating plant goes by default, subject to considerations of capital outlay, notwithstanding the roseate promises of the super-power station advocates.

Returning, then, to the question whether or not colliery steam plant can be dispensed with, I have to express the conviction that the modern colliery must, on the contrary, continue to operate both steam and electrical plant under present and prospective conditions to secure maximum economy.

Since, therefore, colliery motive power is likely to continue to be that of a combination of steam and electricity, there are several vital considerations involved affecting the Association, two of which appear to me to merit special attention.

Colliery Engineering Personnel.

There is, first, the factor of the appearance of a new type of colliery engineer whom we may call the chief engineer. The tendency in the direction of combined colliery steam and electrical practice is no doubt responsible, and in consequence colliery owners are coming to regard their engineering department as one comprehensive whole.

The mining industry has every reason to welcome the advent of this type of extremely capable official. His training and experience of mechanical, steam and electrical engineering applied to colliery work, together with the necessary knowledge of structural design, is placing the modern colliery as an engineering undertaking on a vastly different basis from that which obtained two or, say, three, decades ago.

It is scarcely a digression to refer briefly to the necessity for according to the colliery engineer his own statutory responsibility. The traditional policy of endeavouring to treat the under-manager of the colliery as the second in command is subversive of proper discipline and organisation. The under-manager is, as a rule, a most capable, practical underground man, but is of necessity without the experience or training necessary, either to supervise complex engineering plant, or, on his own authority in the absence of the manager, to take decisions, emergency or otherwise, of an engineering nature. And yet the statutory reports of the engineering department, instead of having to be countersigned by the manager and the engineer, or his deputy, have to be countersigned by the manager and by the under-manager. I submit that the under-manager of a large colliery, with any meaning attaching to his signature, cannot countersign the boiler reports of a complex modern colliery boiler plant or other reports of a similar nature.

A reform in this direction is considerably overdue, apart altogether from the wider question of the certification of colliery engineering officials.

Need for Reliable Data.

The second factor involved in the observed evolution of colliery engineering is the need for impartial authoritative and reliable data as to the economic and other relationships obtaining in practice between the use of steam, compressed air, and electricity in colliery work. There are numberless figures, the results of trials under circumstances approaching to test-bed conditions, but in comparatively few instances do these bear any relation to the overall running results of a week or longer period under normal working conditions.

The presentation of actual impartially-presented overall performances of colliery plant, modern and modernised, is of prime importance to the industry at the present stage of its development. The Association of Mining Electrical Engineers is peculiarly fitted to supply this need, but in so doing it requires in particular the continued active co-operation of the colliery electrical, mechanical and chief engineer.

The Association does not rest content with discussing the merits of electrical plant only. It is anxious, in addition, through its transactions to assist the colliery engineer in deciding whether or not to install particular plant in any circumstances. In this, as in all other connections, no evidence is so welcome and so reliable as that of the man who combines the necessary training with actual everyday experience.

Legal.

Willson v. Halifax Corporation.

ON July 21st at the West Riding Assizes, Leeds, before Mr. Justice Acton, Mr. George Henry Willson, managing director of Messrs. Smith, Barker & Willson, Ltd., engineers, sued the Halifax Corporation for damages for malicious prosecution.

Mr. W. J. WAUGH, K.C., for the plaintiff, said that the company was a substantial one, and his client a man of unblemished character. Up to 1922 the company had been supplied with electricity by the Corporation, but in that year it installed its own generating plant. The Corporation appeared to resent this and threatened to cut off the supply, which was used as a stand-by, unless a certain quantity was used. Early in 1923 an official of the Corporation discovered that a cable at the works had been so connected that energy at a reduced power rate was being used for lighting and heating. A summons was issued against plaintiff and a fellow director for the fraudulent consumption of electricity, but the case was dismissed. It appeared that an electrician had made the connection on his own initiative, and unbeknown to the plaintiff. There had been no word of apology from the Corporation, although Mr. Willson had incurred expense in connection with the summons. Counsel suggested that the Corporation was not solely actuated by a desire to see justice done; there had been malice and a desire to make someone an example for frauds which had become very prevalent. In reply to questions, Mr. Willson said that no advantage had accrued from the wrong connection, as the company was producing energy at a lower rate, nor did the electrician who made the connection derive any advantage from it.

Mr. MORTIMER, for the Corporation, contended that it was necessary for Mr. Willson to prove that there was no reasonable cause for proceeding against him. Although events had proved that there was no justification of the charge, it was launched honestly.

The jury found for the plaintiff for £300, and judgment was entered accordingly.

Metropolitan-Vickers Electrical Co., Ltd., v. British Thomson-Houston Co., Ltd.

IN continuation of this case, Mr. James Swinburne was examined by Sir Arthur Colefax. He said that he had always been more or less connected with electrical work and he had been actually engaged in the manufacture of transformers, dynamos and other electrical appliances. He had read and considered many of the alleged prior specifications and that of Tesla. He had also seen tests made with the alleged infringing machine. He agreed that starting a synchronous motor or synchronous machine involved getting up a synchronous speed and also getting into step with the supply. Prior to 1912 tap starting was a well-known method of starting such a machine and it had been in use for many years prior to 1912. He did not find in Rosenberg's specification any limitation at all of any particular design of synchronous machine as being an element in the alleged invention, and he did not find anything in that specification limiting one as to the design of the starting motor. So far as Rosenberg was concerned, he did not find any distinction drawn between a polyphase and a single-phase machine.

Cross-examined by Sir DUNCAN KERLY, he said that he did not say that the Rosenberg system of starting was no good at all but he looked upon it as one method of starting and no doubt a valuable method. He did not know that there were any practical difficulties in starting rotary converters at the date of Rosenberg's specification which meant a serious objection to the use of rotary converters in practice. There was no trouble in 1912 about the starting of synchronous machines, and particularly rotary converters. There was no fundamental problem to be solved. It was all a matter of arrangement. He had seen a machine made in 1911 which had started perfectly.

The I.M.E.A. and the Commissioners.—At a meeting of the Manchester Electricity Committee, a resolution passed by the Incorporated Municipal Electrical Association at the Annual Congress was considered. This resolution was to the effect that the Association viewed with grave concern the tendency to transfer the generation of electricity from municipal authorities to power companies, and urged that the powers held by companies should not be allowed to restrict the development of municipal undertakings, where the municipalities were in a position to furnish adequate supplies at reasonable prices; and that the decisions of the Electricity Commissioners should be subject to appeal.

The Committee decided to take no action in the matter considering that the implication that the Commissioners showed preference to the companies was unjustified, and that the Commissioners' decisions were as judicial as possible, and, in any case, it was not stated to whom an appeal from these decisions would lie.

The Fulham Electricity and Lighting Committee has also considered the resolution, and is of the opinion that it should be supported by the Borough Council.

Correspondence.

Correspondents should forward their communications **at the earliest possible moment.** *No letter can be published unless we have the writer's name and address in our possession.*

Electric Iron Risks.

The letter of Mr. George Standish appearing in the Electrical Review of July 18th has reference to a matter which has, we believe, had the attention of manufacturers of domestic electric irons for some considerable while.

As your correspondent remarks, several devices have been marketed for the purpose of preventing accidents and damage caused by the over-heating of these appliances.

Dealing with the device, details of which were given in the Electrical Review of the 4th inst., this has the disadvantage of being a somewhat costly and complicated means of achieving the purpose.

A *separate stand* does not render the apparatus foolproof, neither does a switch fitted to the plug connector, as in both instances one depends entirely upon the human element in so far that the iron must be placed on the stand, or the switch must be actuated by the operator. A tumbler switch or plug on the wall achieves the same purpose if we are to rely upon the user's forethought. It must be remembered that most fires occur under unusual circumstances and when a user is suddenly called away.

It is essential for the cut-out to be purely automatic and to act immediately the iron is left, either in haste or in the normal course.

An electric iron which is entirely foolproof is made under the name of "Ortosafe," invented and supplied by Berry's Electric, Ltd., the name implying that it is automatic in action and safe in use. In this pattern the switch is arranged on the plug contact and can only be in the "on" position when deliberately held there by the operator. Should for any reason the user be called away the lever, which is purely gravity controlled, operates the switch to the "off" position.

It is *essential* that an iron be left on during the process of warming up. This is accomplished in the "Ortosafe" by drawing the lever upwards to make contact and tilting the iron on its end. In this position no damage can be done to the table if the iron is left, and should it, by any accident, fall on its face, the gravity lever drops and immediately cuts off current. The fact that the lever maintains the switch in the "on" position while the iron is standing on end quite obviates the desire of the user to jam or in any way fix the switch "on."

Herbert H. Berry.

London, *July 24th*, 1924.

The fatality at Glasgow attending the use of an electric iron (*Daily Mirror*, 19th inst.), reminds us forcibly that while using all our efforts to popularise domestic electricity we must not neglect to earth *all* such portable appliances as irons, kettles, &c. Why by general consent exempt these and bestow attention to the earthing of fixed plant, such as cookers and hotplates?

Why deliberately foster the all-too-prevalent shock-fear of the public when the 3-point plug and triple flex connector are there to insure us against all risk? Personally, I have always provided a third flexible as an earthing conductor, one end terminating in a lug held by one of the clamping bolts on the iron, and the other end in a pin and socket on the plug board rigidly associated with the usual power plug so that both operate as one. This arrangement is in default of providing a 3-pin plug. Every contractor can adopt this method. We simply cannot afford to let these things happen, neither are we doing our duty.

A. Burns.

Watford, *July 24th*, 1924.

With reference to the letter appearing in your issue of July 18th, page 122, on the above subject, it is a somewhat curious thing that there should be so much talk about the risk of fire from electric irons without any comparison whatever being made with the opposing method employed for household ironing generally before the advent of the electric iron.

The occurrence of a fire produced by carelessly leaving an electric iron on circuit directly on the table or other woodwork is such a very rare one, that this fact in itself acquires prominence, and not only the general public, but some of our own men at once jump to the conclusion that electric irons are risky things to have in one's possession. Leave a gas iron directly on a table and see what will happen! The excuse that the gas flame is visible does not hold good in a modern gas iron. I suppose there is not one woman in a dozen who would use an iron of any description without having some sort of an iron-rest to put it upon, and this point brings me to your statement that the "use of the back-rest has resulted in broken terminals." The up-to-date electric iron has a back-rest or stand attached to the iron. The chief object of this is to enable the user to place the iron on its resting point uppermost to heat up from cold. In a properly designed electric iron with a stand raising the iron a sufficient distance from the table, it is a safeguard against the user's inadvertently leaving the current on too long. The stand is always there, has not to be thought of as a separate unit from the iron, and after a little practice it becomes second nature to place the iron point uppermost.

Your comment, moreover, regarding broken terminals as a direct result of attaching a back-rest to an electric iron, can hardly hold good where the iron is fitted with a shroud or guard surrounding the terminals into which the connector fits, the guard being part of the back-rest. In some irons, however, the connector itself is part of the rest, and in this case unless the connector is supported by the handle upright, a certain amount of strain would come on the terminals. These are points of design which are properly taken care of in good class British irons. Your correspondent, however, is wrong in assuming the attached stand to be British practice; America introduced it.

Chas. H. Archer.

Automatic Telephone Manufacturing Co., Ltd.

Liverpool, *July 25th*, 1924.

The Inefficiency of Boiling Rings.

The articles on the subject of electric cooking which have recently appeared in the Electrical Review, and the remarks made last week by Mr. E. G. Ross, A.M.I.E.E., on the inefficiency of boiling-plates, have prompted me to give you my own experiences in this direction.

A short time ago, being somewhat disgusted with the boiling rings of my own cooker, I made inquiries among my friends, and found that of the seven who had installed cookers there was only one who would not gladly change back to gas, could this be done without further expense or trouble. In every case the reason for dissatisfaction was given as the slowness of the hotplates. It is most interesting to note that the one satisfied user was the only one who had a self-contained kettle for boiling water, and that she was seriously considering having the cooker taken out, when she was advised by someone (not, be it noted, by the Supply Co.) to install an electric kettle.

Of the six dissatisfied consumers four use only the grill and oven of their cookers, gas rings being used for all boiling, frying, &c. I have also come across four cases of people who would have installed cookers some time ago but for the fact that they had been strongly advised not to by friends who already had them.

Probably 80 per cent. of the cooking in the ordinary household is done on the boiling plates, and therefore in passing an opinion on the cooker as a whole the user will largely be influenced by the efficiency of the most-used part.

Electric cooking is certainly falling into grave disfavour in this district, and it is due entirely to the fact that the engineers are quite out of touch with the domestic point of view. If this were not so, no cooker would be hired out without an electric kettle. All the cookers in question are of a well-known make, and are fitted with 1.3-kW open hotplates of the oldest type, in which the elements are quite 1 in. to 1¼ in. below the utensil. They take 16-17 minutes to boil two pints in an ordinary aluminium kettle, as against 11 minutes in an electric kettle of half the loading.

If only supply engineers will realise that they must hire out cookers of the very latest and best designs, and an electric kettle with each one, nothing can prevent electric cooking from becoming the only method worthy of consideration.

"Cuisinier."

Newcastle-upon-Tyne, *July 8th*, 1924.

Information Bureaux and Special Libraries.—A conference will be held at High Leigh, Hoddesdon, Herts., during the week-end September 5th-8th, to which are invited all who utilise information systematically, or who are interested in the conduct or operation of information bureaux, intelligence services, and special libraries. The programme will include papers and discussions on the functions, future developments, and the methods and equipment of intelligence bureaux, and on their relations with other institutions, including national and public libraries. Further information may be obtained from Mr. A. F. Ridley, Athenæum Chambers, 71, Temple Row, Birmingham.

The British Association.—The meeting of the British Association in Toronto commences on Wednesday next, when the president, Major-General Sir David Bruce, K.C.B., F.R.S., will deliver his address on "The Prevention of Disease." The meetings of the various Sections are all to be held in the University buildings, which cover a wide area in the vicinity of the Ontario Parliament buildings. The meetings of the main body will take place in the Convocation Hall. The programme includes three "citizens' lectures" (including one on "Einstein's Theory of Relativity," by Prof. A. S. Eddington, F.R.S.), and three lectures to children, one of which will be given by Sir William Bragg, K.B.E., F.R.S. Prof. G. W. O. Howe, president of Section G—Engineering, will deliver his address, "One Hundred Years of Electrical Engineering," on August 7th.

Business Notes.

Bankruptcy Proceedings.—MEYER DAVID ROSENBLOOM (trading as D. Rose & Co.), 25, Osborn Street, Whitechapel, dealer in electric lamps.—This debtor appeared last January in the London Bankruptcy Court, with total liabilities £2,293 (unsecured £2,268) and assets valued at £757. He attended recently before Mr. Registrar Mellor for public examination, in the course of which he stated that he was born at Piesk, Russia, of Jewish parents, and was brought to this country by his parents about 1898. He commenced business on his own account in 1904, and in October, 1918, he registered "D. Rose Machine Supplies Co., Ltd., to take over his business. That company went into liquidation in 1921, and in August of that year he recommenced trading on his own account. During the spring of 1923 he was selling lamps which were alleged to be an infringement of the British Thomson-Houston Co.'s patent, and he was served with a writ asking for an injunction and for damages for infringement. He unsuccessfully defended the action, and had paid £34 in respect of costs; in addition, he had sustained further loss through his having neglected his business while fighting the action. He was aware that the British Thomson-Houston Co. was fighting actions broadcast for the protection of its patent, but he was advised to put in a defence, and acted on that advice. Witness attributed his failure to lack of capital, to his frequent illnesses, and to heavy depreciation in the value of his stock-in-trade. Upon the application of the Official Receiver, the examination was adjourned till November 4th, and the debtor was ordered to lodge an amended statement of affairs within 21 days.

LEONARD ALDRIDGE RADFORD, 50, Welford Road, Leicester, electrical engineer.—The receiving order in this matter was made on July 14th, on debtor's own petition. According to the statement of affairs there are liabilities amounting to £320 and the assets are estimated to realise £145, leaving a deficiency of £175. Debtor attributes his failure to the creditors forcing his hands, and putting his estate to considerable expense by proceedings; his partnership was a failure and the liabilities he assumed on dissolution were too heavy for him. It appears that he entered into partnership with another and commenced business at the above address as electrical engineers, with a capital of £150, of which his contribution was £50, which he saved while employed in a similar business. In February, 1924, debtor's partner withdrew from the business, and debtor carried on alone, but owing to pressure by creditors he found it difficult. The first meeting of the creditors herein was held on July 25th, at the Official Receiver's Office, 1, Berridge Street, Leicester. The case, being a summary one, was left in the hands of the Official Receiver as trustee. The following are creditors:—

	£		£
Bramwell Engineering Co. ...	27	British Thomson-Houston Co., Ltd.	40
C. V. S. & I. E. Co., Ltd. ...	29	General Electric Co., Ltd. ...	28
Edison Swan Electric Co., Ltd.	23	S. Eaton & Sons	18
Fuller's United Electric Works, Ltd.	21	H. H. Flavell	18
E. C. S. Co., Ltd.	15		

RICHARD HAMMOND, 3, The Arcade, George Street, Richmond, Surrey, electrical engineer.—The receiving order in this matter was made on June 14th, on debtor's petition. According to the statement of affairs there are liabilities amounting to £1,846 and assets of £824. Debtor attributes his failure to the granting of too extensive credit, and undertaking recently a larger contract than was justified by his capital; depreciation of stock; trading in and overstocking of wireless instruments, and attempting to obtain a wholesale connection in wireless to the detriment of his local business. The Official Receiver stated that debtor commenced business with £40 capital in May, 1920. He traded successfully until December, 1923, when he undertook a contract (£543), which is now almost completed. Since May 20th, 1924, three executions have been levied against him. A private meeting of his creditors was held on June 11th, 1924, when a statement was presented showing liabilities of £2,073, and assets of £768. An offer of a composition of 8s. 6d. in the £ under a deed of assignment was made, but this was not accepted. Debtor appears to have kept proper books of account from February, 1924.

SIDNEY ARTHUR WARDELL, 83, Raleigh Road, Richmond, Surrey, electrical engineer.—The first meeting of the creditors herein was held on July 21st, at 29, Russell Square, W.C.1. According to the statement of affairs there were liabilities amounting to £680, and assets of £11. Debtor attributed his failure to lack of capital, inexperience in estimating contracts, and consequently taking work at too low prices, inability to collect balance of amount due under a completed contract, loss by burglary, and law costs. It appeared that he commenced business on his own account without capital at the above address, but owing to inexperience in estimating he undertook contracts at prices which did not show sufficient profit. In December, 1921, he entered into a contract to install at Woldingham an electric light plant, batteries, &c., at a cost of about £900. He completed the contract, but his customer refused to pay a balance of about £200 on the ground that he had already paid an equivalent sum on his account to two wholesale houses for plant, &c., supplied on the job. He took proceedings against the customer for the recovery of the amount, but the proceedings had not continued owing to lack of funds, and being pressed by creditors, debtor filed his petition. Debtor further stated that at the date of the receiving order there were five contracts in hand for £168, of which he received £87, leaving a balance of £81, subject to the estimated cost of completion, £36. At a meeting of the principal creditors held on July 14th, 1924, an offer was made by debtor's father for the purchase of the Official Receiver's interest in the contracts; the purchaser to pay to the Official Receiver £25 in cash, and also pay the weekly wages due July 12th, 1924, amounting to about £10, and further to take over all liability in respect of two apprenticeship premiums of £50 each, paid in February, 1924.

EDWARD GEORGE NICKS, 19, Ruby Street, Bedminster, Bristol, lately 141, North Street, Bedminster, electrical engineer.—The receiving order in this matter was made on June 14th, on debtor's own petition. According to the statement of affairs there were liabilities of £438 and assets of £121, leaving a deficiency of £317. Debtor attributes his failure to want of capital and bad trade. He commenced business in March, 1923, with a capital of £20, as an electrical and motor engineer. The only books of account kept were a takings book and sold ledger. The following are creditors:—

	£		£
Rosina Couzens	340	Simpson, Baker & Co.	78

LEONARD KELSALL AND HAROLD KELSALL, trading as Kelsall Bros., Castle Hill Place, Maison Dieu Road, Dover, electrical engineers.—The receiving order in this matter was made recently on debtors' own petition. According to the statement of affairs there were liabilities amounting to £3,165, and assets of £585. Debtors attributed their failure to want of capital, competition, general trade depression, and diminished turnover. The first meeting of the creditors was held recently at Carey Street, London, W.C. The following are the principal creditors:—

	£		£
British Thomson-Houston Co., Ltd.	23	Bankers	2,340
Edison Swan Electric Co., Ltd.	89	Radio Instruments, Ltd. ...	276
Foster Engineering Co., Ltd. ...	35	Sloan Electrical Co.	274
Falk, Stadelmann & Co., Ltd. ...	22	Supra Electrical Co.	70
G. W. T., Ltd.	20	J. & W. B. Smith, Ltd.	42
W. T. Henley's Telegraph Works Co., Ltd.	33	Service Trading Co., Ltd. ...	17
		Robert Pinder	90

A. JONES, electrical engineer, 2, Robert Street, Ynysybwl, Glamorgan.—Receiving order made July 19th, on debtor's own petition.

W. PRICE (separate estate) (a partner in the firm of PRICE AND CO.), electrician, 29, Russell Street, Plymouth.—Last day for proofs for dividend, August 6th. Trustee: A. N. F. Goodman, 11, St. Aubyn Street, Devonport.

J. S. MCLEOD (McLeod Bros, 189, Blackburn Road, Bolton), and (with a partner) as McLeod Bros., at 55, Chorley New Road, Horwich, radio and electrical engineer.—Debtor filed his petition on July 16th, and receiving order was made.

A. C. R. BIRKETT, 44, Ebers Grove, and 22 & 24, Wheeler Gate, Nottingham, electrical engineer.—Debtor filed his petition on July 21st, and receiving order was made.

Company Liquidations.—RE-ECHO ELECTRICAL MANUFACTURING CO., LTD., 43, Johnson Street, Westminster.—A compulsory winding up order has been made against this company. The first meetings of the creditors and shareholders were held last week at the Board of Trade Offices, Carey Street, Lincoln's Inn, W.C. Mr. G. D. Pepys, the Official Receiver, reported that the winding up order was made on May 13th, on the petition of the British Broadcasting Co., Ltd. The company was registered on January 4th, 1923, in the name of the Re-Echo Wireless Mfg. Co., Ltd., with a nominal capital of £3,000 in £1 shares, and in the following March the capital was increased to £4,000 and the name changed to the present title. The company was formed to acquire and carry on as a going concern the business of manufacturers of wireless telephone parts carried on by S. F. O'Hara & J. Baptiste Bignamy at 11, Hatton Wall, Hatton Garden. The purchase consideration was £2,248, payable as to £250 in cash and as to the balance by the allotment of fully-paid shares to the vendors. At the date of the winding up order the directors of the company were Wm. R. Hargroves, J. B. Bignamy, Capt. C. W. Dann, and W. Taplin, who apparently received no remuneration as directors, but who were respectively the chairman and managing director, factory manager, sales manager, and the secretary, and received salaries in respect of those offices at the rate of £8 a week each, and in this way received between them £1,726. Taplin had stated that shortly before he was appointed director he was shown a rough trading account of the first two months' trading of the company, and the result was a net profit of about £1,200. In view of that state of things he agreed to invest £2,000, which he did. The issued capital of the company was £4,000, of which £2,002 was subscribed in cash. The company's business consisted of manufacturing wireless receiving sets, which were apparently in great demand at the time of the formation of the company in January last year, but in the following March questions arose between the P.M.G. and the British Broadcasting Co., Ltd., in respect of royalties on receiving sets. This caused a depression in the wireless trade. The company therefore

looked about and endeavoured to get business on different lines and develop a general electrical business. Taplin had also stated that on September 29th it was announced that the royalties on wireless sets were to be greatly reduced, but at some future date. The result of that was that prospective buyers of wireless sets postponed making their purchases. At this time the company was in want of further working capital for both branches of its business, and Taplin advanced £1,200, and subsequently a further £300 was secured by a debenture. In addition to those loans, Hargroves and Taplin lent the company a sum of £250 each, and in December of last year it was resolved that a second debenture of £500 should be issued to those gentlemen as security. On February 14th last Mr. Taplin appointed a Mr. Richards receiver on his behalf, and on March 24th it was resolved to voluntarily wind up the company, and Mr. Richards became the liquidator. Taplin had stated that the company was advised by Bignamy, who was the technical director, that in his opinion the sets manufactured and sold by the company were not subject to the payment of a royalty, and no provision had been made for such a payment in fixing the sale price of the sets, which was too low. On the other hand, Bignamy had asserted that he did not give such advice, and that the directors must have known that the royalty was payable as soon as the licence was granted, and the royalty should have been added in fixing the selling price. The failure was attributed to depression in trade, to bad debts, and to the unexpected liabilities in connection with the royalties.

Mr. Richards, the receiver, who was carrying on the business for the purpose of realising the stock, had reported that the probability of realising sufficient to pay the claims of the first debenture holder was remote.

The Official Receiver added that the statement of affairs showed liabilities £4,122, of which £2,956 was unsecured, and assets £1,166, but that this amount was not sufficient to meet the debenture holders' claims, and that as debentures for £1,500 were good, there was no prospect of anything coming to the unsecured creditors.

The liquidation, in the absence of any resolutions, remains in the hands of the Official Receiver.

The following are among the creditors:—

	£		£
Hightensite	19	T. W. Lowenadler	45
Radio Times	25	Magnolia Co.	160
Crystalate Co.	39	McDonell & Jackson. (Estd.) ...	50
— Doherty	67	Gas, Electricity and Telephone (Estd.)	22
Turner Hunter	102	B. B. Co., Ltd.	896
W. R. Sykes, Ltd.	39	Marconi Co.	273
G. E. Hough	24	Kirk & Kirk. (Estd.)	15
Albion Manufacturing Co. ...	17	Rent	41
Fuller's United Electric Works, Ltd.	65		

INTERNATIONAL LINGUAPHONE CO., LTD.—Winding up voluntarily. Liquidator, Mr. F. Rowland, 3, Thames House, Queen Street Place, Queen Street, E.C. Meeting of creditors, August 5th, at the office of the liquidator. Particulars of claims to be sent to the liquidator forthwith.

BIRMINGHAM ELECTRIC CASTINGS, LTD.—A meeting of members is called for August 26th at 5, Waterloo Street, Birmingham, to hear an account of the winding up from the liquidator, Mr. J. D. Kerr.

LOWKE JERSEY, LTD., electrical engineers and contractors, 18, Gloucester Street, Jersey.—At a meeting of creditors on July 25th, Mr. J. T. A. Willcox was appointed liquidator, and he was instructed to realise the assets. Claims to the liquidator by August 5th.

STOLS ELECTROPHONE CO. (1914), LTD.—Liquidator (Mr. H. E. Burgess) released July 21st.

SIMMS MAGNETO CO., LTD.—Meeting, August 29th, at 7, New Court, W.C.2, to hear an account of the winding up from the liquidators, Messrs. A. White and E. H. Hawkins.

WIRELESS DEVELOPMENT SYNDICATE, LTD.—Winding up voluntarily. Liquidator, Mr. F. Morse, 1 and 2, Great Winchester Street, E.C.2.

Private Arrangement.—THOMAS JOHNSTON, electrical engineer and contractor, 29, Lowther Street, Whitehaven.—A meeting of the creditors of the above was held on July 22nd at the offices of Mr. Parkin S. Booth, 2, Bixteth Street, Liverpool, when a statement of affairs was submitted which disclosed liabilities of £955, total assets of £489, and net assets £474, or a deficiency of £480. The debtor started in business in June, 1921, with a capital of £100, which he borrowed. No proper books were kept, but the turnover was about £40 per week, while debtor's drawings were at the rate of about £3 weekly. The partly-secured creditor was the bank, which held a policy on the debtor's life. After discussion a resolution was passed to the effect that a deed of assignment should be executed to Mr. Booth as trustee, with a committee of inspection. It was also decided to allow the debtor 14 days in which to see his friends with a view to purchasing the business as a going concern. The following are creditors:—

	£		£
Paxendale & Co., Ltd.	42	Mossop & Donnelly	17
E. L. & Helsby Cables, Ltd. ...	15	Owen, Robert	21
Downes & Davies	325	Steel Tubes & Conduits, Ltd. ...	14
G.E.C. Ltd.	35	Ward & Goldstone, Ltd.	17
Hirst Bros. & Co., Ltd.	20	*Whitehaven News*, Ltd.	20
Metropolitan-Vickers Electrical Co., Ltd.	22		

Dissolutions of Partnership.—TURNER BROS. (W. Turner and R. Turner), electricians, Seedhill Electrical Works, 117, Castlegate, Huddersfield.—Partnership dissolved. Mr. W. Turner continues the business, and attends to debts, &c.

CRESWICK DIXON ELECTRIC CO. (G. Creswick and B. E. Dixon), electrical engineers and merchants, 63, Chesterfield Road, and 101, Albert Road, Sheffield.—Partnership dissolved. Mr. Dixon continues the business under the same title, and attends to debts, &c.

Deed of Assignment.—WRIGHT BOTTOMLEY (trading as Bottomley, Frampton & Co.), 90a, Church Street, Blackpool, electrical engineer and contractor.—Creditors should send particulars to Mr. J. Todd, 18, Birley Street, Blackpool, a trustee, by August 26th.

Catalogues and Lists.—THE ENTERPRISE MANUFACTURING CO., LTD., Electric House, Grape Street, Shaftesbury Avenue, W.C.2.—A net price list of electrical equipment, including lighting fittings, radio apparatus, domestic appliances, &c.

SIEMENS & ENGLISH ELECTRIC LAMP CO., LTD., 38-39, Upper Thames Street, E.C.4.—Catalogue No. 71, containing illustrations and prices of electric bells, indicators, pushes, &c.

THE ENGLISH ELECTRIC CO., LTD., Queen's House, Kingsway, W.C.2.—Publication No. 364, a revised pamphlet dealing with the company's asynchronous-synchronous motor. Fully illustrated.

MESSRS. E. BROOK, LTD., Empress Works, Huddersfield.—A folder illustrating examples of the firm's electric motors.

METROPOLITAN-VICKERS ELECTRICAL CO., LTD., Trafford Park, Manchester.—Leaflet No. 379/3-1, dealing with two types of distribution transformers, 3-phase up to 130 kVA, and single-phase up to 75 kVA respectively. Also Descriptive Leaflet No. 69/1-1, treating of single- and double-pole limit switches for a.c. and d.c. circuits.

BRITISH THOMSON-HOUSTON CO., LTD., Crown House, Aldwych, W.C.2.—A folder describing the company's "Type R" radio valve for rectification and amplification.

MR. ERNEST J. BATY, 157, Dunstable Road, Luton.—Pamphlets advertising "universal" radio receiving sets, &c. Priced.

MESSRS. ISENTHAL & CO., LTD., Denzil Works, Willesden, N.W.10.—An illustrated booklet describing an automatic voltage regulator for d.c. generators up to 200 kW, &c.

THE GENERAL ELECTRIC CO., LTD., Magnet House, Kingsway, W.C.2.—Leaflet V.3309, containing an illustrated description of the "Valley" battery charger. Priced.

THE CAPAC CO., LTD., 24, Bruton Place, New Bond Street, W.1.—An illustrated pamphlet describing in detail the "Bin-Aural" system of detecting noises in machines.

MESSRS. JAMES MCMILLAN & CO., Clun House, Surrey Street, W.C.2.—An illustrated price list of electric immersion heaters.

The Eight-hour Day Bill.—A Bill has been introduced by the Government to confirm the draft convention on the subject of the eight-hour day adopted at the Washington Conference of the International Labour Organisation of the League of Nations. The Bill, which covers manufacturing, mining, constructional work, transport, public utility operation, &c., seeks to establish a maximum of eight hours' work per day or 48 hours per week. There are certain specified relaxations of, and exemptions from, this general rule, as in cases of accident or emergency, in the employment of members of a family by one of them, in the case of supervising workers, &c. The Act applies to Scotland, and also covers employés of the State.

Unemployment.—There was a further increase in the number of unemployed during the week ended July 14th. The total registered at the Employment Exchanges in Great Britain was 1,026,000, representing an increase of 1,450. The reduction since the beginning of the year has been about 260,000.

The Accumulator Makers' Association.—This Association has appointed Mr. D. C. McLagan as Secretary and has opened new offices at 49-50, Parliament Street, Westminster, London, S.W.1, to which address all communications should be sent. For the past 12 years the work has been carried on from the offices of the D.P. Battery Co., Ltd., 11, Victoria Street, Westminster, London, S.W.1, by Mr. E. S. New, who has now been appointed sales manager of the D.P. Battery Co., Ltd., in *lieu* of the position of London manager, which position he occupied until recently. On his retirement from the secretaryship Mr. New was the recipient of a presentation which included a handsome piece of antique silver.

Brazilian Electrical Scheme.—Private interests, in which British capital is concerned, have submitted a proposal to the Government of Bahía (Brazil) to take over the entire system of street railway lines of the State, and assume responsibility for bonded indebtedness already incurred. Light, power and telephone rights will also form part of the system's holdings. It is proposed to utilise part of the capital for the erection of an electric elevator, located between the upper and lower portions of the city, as well as a large new hydro-electric station on the Paraguassú river about 65 miles from the city. British manufacturers of electrical equipment will be allowed to tender for the machinery and equipment needed.—*Reuter's Trade Service* (Bahia).

Swedish Electrical Goods for Russia.—Reuter quotes the Stockholm papers to the effect that a representative of the Russian Electric Trust has arrived there from Leningrad for the purpose of concluding contracts for the delivery of electrical goods to the total value of about 1,000 000 gold roubles. An order amounting to 250,000 gold roubles had already been given to the Tungsten Wireworks Company at Stockholm.

Book Notices.—"The Henley Telegraph," June, 1924. London: W. T. Henley's Telegraph Works Co., Ltd. Price 6d. net. This is one of the few staff magazines which manage to steer clear of "shop." The articles are bright and well-written and capable of being read by a wider public than that for which the "Telegraph" caters. An interesting contribution is an autobiographical sketch of the early life of the late W. T. Henley, the founder of the company.

"The *Journal* of the Institute of Transport." Vol. V, No. 9, July. London: The Institute. Price 10s. 6d.—In this issue of the *Journal* appears a report of the proceedings at the Annual Congress which was held at Bristol at the end of May, together with the papers read at this function.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLIII. No. 7. July, 1924. New York: The Institute. Price $1.

"Costruzioni Elettromeccaniche." By Ing. E. Morelli. Vol. III. Turin: Union Tipografico-editrice Torinese. Price L.18.

"Science Abstracts." A. & B. Vol. XXVII. Part 7. July 25th, 1924. No. 319. London: E. & F. N. Spon, Ltd. Price 3s. each.

"An Introduction to the Strowger System of Automatic Telephony," by H. H. Harrison, M.I.E.E., M.I.R.S.E. Pp. vii+146; figs. 86. London: Longmans, Green & Co. Price 7s. 6d. net.

"The Trade Industries, Products, and Resources of South Africa and Adjacent Territories," compiled by C. W. Francis Harrison, F.S.S., F.R.G.S. Pp. 543; illustrated. Woodchester, Glos: Arthur's Press, Ltd. Price 22s., post free.

"Electric Wiring Diagrams for Motor Vehicles," by M. A. Codd. Pp. 96; figs. 92. London: E. & F. N. Spon, Ltd. Price 3s. 6d. net.

Australian Electrical Wiring Rules.—His Majesty's Trade Commissioner at Sydney has forwarded to the Department of Overseas Trade, copies of the recently revised Electrical Wiring Rules of the Institution of Engineers, Australia. These rules are applicable to all States of the Commonwealth with the exception of Victoria, where the Rules of the State Electricity Commission are in force. The differences between the two sets of rules are not, however, of very great moment. We are informed that the rules may be consulted by interested United Kingdom firms on application to the Department of Overseas Trade (Room 52), 35, Old Queen Street, London, S.W.1. (Reference No. B.X.1118).

Tramway Employés' Wages.—A tribunal has been set up to consider the tramway employés' claim for improved wages and conditions, and the first meeting was held on Tuesday last. Sir William Mackenzie (chairman of the Industrial Court) is chairman of the tribunal, and the members are Sir Allan Smith, Sir William Larke, Mr. A. A. Purcell, M.P., Mr. J. J. Mallon, Mr. E. Bevin, Mr. J. Cliff, Mr. G. Dobson, Mr. T. McLean, Mr. J. C. Trustrum, Sir John Timpson, Ald. C. Higham, Mr. A. Baker, Mr. R. J. Howley, and Mr. H. Holliday. These represent both sides in the dispute, the first four members named being representative of independent employer and labour interests.

At the first sitting of the tribunal Mr. Clay gave evidence in support of the men's claim. He said that the proposed grading system was the logical development of a policy which had been pursued for some years. The minima proposed for motormen and conductors were as follows:—Grade I, £3 3s. 6d. and £2 19s. 6d., respectively; Grade II, £3 and £2 15s. 6d.; Grade III, £2 14s. 6d. and £2 12s. 0d.; and Grade IV, £2 13s. 0d. and £2 12s. 0d. Mr. Clay said that the men were determined not to be governed by the 1914 standard; they demanded a larger and fuller mode of living. A number of questions were put to Mr. Clay and the tribunal adjourned until the following day.

French Failure.—The failure of the Société des Appareillages Electriques Grivolas, Paris, has been gazetted.

High-pressure Water System.—The London Hydraulic Power Co. has sent us a map of London on which is indicated its extensive system of high-pressure (700 lb. per sq. in.) mains.

British Empire Exhibition Notes.—The Western Electric Co., Ltd., of Connaught House, Aldwych, London, W.C.2, has prepared as an Exhibition souvenir an "Electrical Mah Jong" set consisting of 144 cards divided into six suits made up respectively of the following cards:—Radios; cables; 'phones; honours; winds; periods and symbols. A pocket guide fully details the laws of play and how to keep the score, and a scoring block is provided. In mastering the game, and no doubt in subsequent exciting play as well, the mind of the player becomes permanently impressed by the colour designs of Western Electric valves, cable sections, telephone instruments, &c. The set has been excellently produced for the company by Messrs. Thomas De La Rue & Co., Ltd. We are asked to state that *bona-fide* electrical dealers who are interested can obtain a Mah Jong set on application to the Western Electric stand Avenues 9 and 10, Bays 18-20) in the Palace of Engineering.

On July 19th the employés of the UNION CABLE CO., LTD., visited Wembley. The party of over 350 was conveyed by special train from Barking, and then split up into small groups so permitting all to visit the exhibits that interested them most. The party was accompanied by the general manager, Mr. J. Snow Huddleston.

THE STERLING TELEPHONE & ELECTRIC CO., LTD., has issued a card bearing on one side a view of the company's stand and on the other an invitation to visit it.

On the stand of MESSRS. S. RENTELL & CO., LTD., are to be seen a number of historical electric lamps. These are:—An original Swan lamp and an Edison lamp which were used at the Crystal Palace Electrical Exhibition in 1882; an original "Swan United" lamp; two Khotinsky lamps, one of which has pink stripes in the bulb; and a Woodhouse & Rawson lamp, *circa* 1887. There is also on view a primitive fuse carrier in which the fuse wire is fastened to wood screws.

The Japanese Earthquake.—*The Times* recently stated that the cost of the damage caused to the plant of the Tokyo Electric Light Co. by the recent serious earthquake is estimated at £1,804,250. In addition to repairing this damage the company is undertaking improvements which will cost a further £700,000. The necessary funds will be obtained partly from reserves and partly from the reduction of the ordinary dividend for a few years. Seven of the company's 30 hydro-electric power stations were damaged, but in all cases the generating machinery escaped injury. The four steam stations, representing 10 per cent. of the generating capacity, were damaged. Thirty-seven of the 111 sub-stations were damaged, but only 13 were totally destroyed. With the exception of about a quarter of the overhead equipment, the transmission system virtually escaped damage.

Electrical Standardisation in Australia.—Good progress is beginning to be recorded by the Australian Commonwealth Engineering Standards Association which was founded towards the end of 1922. Committees of the Association have recently been formed in New South Wales, Victoria, Tasmania, and Queensland, while nine sectional committees are at work in drawing up a series of standard specifications, among them being one having special reference to electrical fittings and equipment.

Radio Sets for Italy.—The Italian Ministry of Posts and Telegraphs in Rome has issued a notice drawing the attention of manufacturers and sellers of radio receiving sets to the fact that only such sets as are approved by the Ministry of Communications can be sold in that country. In order to avoid unnecessary delay in placing their instruments on the market, firms desirous of manufacturing or selling in Italy should get into touch with the Higher Institute of Posts and Telegraphs, Via del Ré, Rome, whence full particulars of the conditions can be obtained.

British Trade Mark Applications.—The following are among the recent applications for British trade marks. Objections against any of the proposed marks may be lodged within one month from the dates mentioned:—

Energo. No. 445,083. Class 8.—Instruments and apparatus for use in wireless telegraphy and telephony. Anton Lodewyk van der Velde, 2, Olivers Yard, City Road, London, E.C.1. July 23rd, 1924.

Memette. No. 448,213. Class 13.—Electric switches (ordinary), electric fuses, and cut-outs. The Midland Electric Manufacturing Co., Ltd., Stafford Works, Barford Street, Birmingham. July 23rd, 1924.

Electricians' Wage Claim.—It was announced last week that the employers of the London electricity supply industry had made certain proposals in connection with the claim for increased wages made by the employés, which has resulted in a vote in favour of a strike. The terms of this proposal were not divulged, but were to be considered at a meeting of the unions concerned in London yesterday. A meeting was held on the previous day to consider the question in its national aspect.

Cold-starting Engine Award.—The "S Type" cold-starting engine made by Messrs. Petters, Ltd., has received a further award in the form of the Staffordshire Agricultural Society's silver medal.

Annual Holidays.—The Witton works and offices of the GENERAL ELECTRIC CO., LTD., will be closed from this evening until the morning of August 11th for the August holidays.

The MIDLAND ELECTRIC POWER INSTALLATION CO., of Wolverhampton, announces that its re-winding department will be closed from to-night (Friday) until the morning of August 11th for the holidays.

The works of AUTOMATIC & ELECTRIC FURNACES, LTD., will be closed for the annual holidays from August 2nd to 10th inclusive, but the demonstration rooms and offices will remain open.

The works of the ELECTRIC CONSTRUCTION CO., LTD., will be closed from Saturday, August 2nd to August 10th inclusive. The offices will be closed from August 2nd to 5th inclusive.

"Exide" Batteries.—Mr. E. A. D. Eldridge's "Fiat" motor-car, which broke the flying and standing kilometre and flying mile records at Arpajon, and Mr. J. G. P. Thomas's "Leyland," which broke the 5- and 10-mile and 10-kilometre records, both used Exide batteries for ignition. The American aeroplane pilots, after their arrival in this country during the world flight, took advantage of the services of Mr. E. M. Parsons's Exide battery service station for Hull and district on their arrival at Brough.

Copper and Lead Prices.—Messrs. F. Smith & Co. report, July 28th:—Copper (electrolytic) bars, £68 10s., £2 increase; ditto sheets, no change; ditto, wire rods, £78 10s., £2 increase; ditto, h.c. wire, 9 13/16d., 3/16d. increase.

Messrs. James & Shakespeare report, July 29th:—Copper bars (best selected), sheet and rod, no change; English pig lead, £35, £1 increase on last week's quotation.

Trade in Czecho-Slovakia.—It is reported from Prague that the A.E.G.-Union of Vienna proposes, in conjunction with the Berlin A.E.G. and the A.E.G.-Ringhoffen of Prague, to establish large electrical works in Brunn as the present duties render it impossible to get manufactures into Czecho-Slovakia. The negotiations on the question with the Bohemian Discount Bank and the Moravian Discount Bank, which would participate in the new undertaking, are said to have made great progress, although if the Czecho-Slovakian duties are reduced, as is held in prospect, it is possible that the scheme may not be proceeded with.

German Radio Exhibition.—Under the auspices of the German Verband der Radio Industrie the first radio exhibition to be held in Germany is to take place in Berlin from September 26th to October 6th next.

Catalogues Wanted.—MESSRS. W. L. TURNER & Co., of 64, Victoria Street, London, S.W., ask for manufacturers' catalogues of electrical supplies.

Cable Works Strike.—Towards the end of last week about 600 employés at the Pirelli Cable Works, Southampton, ceased work on account of the employment of a non-union man on winding.

Lighting and Power Notes.

Burton-on-Trent.—SPECIAL ORDER.—The Town Council is applying to the Electricity Commissioners for a Special Order authorising it to supply electricity to various districts outside the borough.

Continental.—GERMANY.—The potential hydro-electric power in Germany is estimated at 1,425,000 h.p. In 1922 about 43 per cent. of this power was utilised, but when the hydro-electric works now under construction are completed 1,300,000 h.p., or 92 per cent., will be developed. In Wurtemberg the big Neckarwerk is under construction; two generating stations are already working, and in Baden important works are projected. At present the supply of electricity in this district is obtained from the Murg Kraftwerk, which provides current for the Palatinate by means of a 100,000-V transmission line. The principal establishment projected by the Baden Government in the south of the Black Forest is the Schluchsee Werke, which will be built in several stages; when completed, the output will be 200,000 h.p. The Prussian State plans the erection of hydro-electric power stations on the Main and the Weser, and in Schleswig-Holstein hydro-electric works are planned by the Lauenburg district to utilise the waters of the Schaalsee, which will be diverted towards the Ratzeburg lake, lying 30 metres lower. Work is to be commenced very shortly, and it is expected that it will be completed by the autumn of next year.—*Reuter's Trade Service* (Berlin).

RUSSIA.—A large hydro-electric plant to utilise the water power of the River Volchov to meet the requirements of Leningrad is in course of construction about 70 miles from the city. The initial plant will comprise eight sets of vertical-shaft turbines and generators, and eventually the station will have a total capacity of 54,000 kW.

FRANCE.—The Société Electrique de la Siderurgie Lorraine of Paris has secured a concession to establish a 30,000-V transmission line between the Amanvilliers sub-station of the Société de la Houve and its mines at Montois-les-Montagnes, in Alsace-Lorraine.

Dundee.—NEW PLANT.—The Town Council is to install a 12,500-kW turbo-alternator and two boilers at the electricity works, and sanction has been received from the Electricity Commissioners to the borrowing of £130,000 for the purpose.

Electricity Districts.—LONDON AND HOME COUNTIES.—Following on the further local inquiry held by the Electricity Commissioners in May last in respect of the draft Order and scheme for the reorganisation of the supply of electricity in the above-mentioned district, the Commissioners have made an order giving effect to the scheme approved by them, which has been submitted by the Commissioners to the Minister of Transport for confirmation.

EAST MIDLANDS.—*Advisory Board's First Meeting.*—Sir Harry Haward, vice-chairman of the Electricity Commission, presided at the first meeting, which was held at the Guildhall, Nottingham, on July 24th, of the East Midlands Electricity Advisory Board, there being present representatives of Derby, Leicester, Nottingham, Burton-on-Trent, Mansfield, Loughborough, Long Eaton, the Derbyshire and Nottinghamshire Electric Power Co., the Melton Mowbray Electric Light Co., and the County Council of Derby, together with two representatives of large consumers in the district and two representatives of the London, Midland, and Scottish Railway Co., and of the London and North-Eastern Railway Co. Occupying the position previous to the appointment of a regular chairman, Sir Harry Haward observed that the attention of the public was being specially drawn to the development of electricity supply, and it seemed probable that there would be a discussion in Parliament shortly on the subject. Perhaps the present arrangements would pass under review, and their adequacy to meet the needs of the country might be raised. The Electricity Commissioners were fully alive to the position, and in their fourth annual report, which he hoped would be published next month, would be found some pertinent observations upon the progress made. Dealing with the potential work of the East Midlands Board, he pointed out that the area of the district was approximately 1,732 sq. miles, the population in which, according to the 1921 census, was approximately 1,455,000, and the rateable value approximately £8,186,000, there being 10 undertakers authorised to supply electricity in the district. The total capital expenditure of electrical undertakers, excluding the two power companies concerned, amounted at the beginning of 1923 to £3,735,744. The total energy, excluding sales in bulk, actually sold in the district in 1923 was approximately 112 million kWh, or about 80 kWh per head of population. At the beginning of 1920 the total generating plant installed by authorised undertakers was 53,337 kW. At the present time the total generating plant installed or sanctioned was 164,187 kW, which showed an increase in 4½ years of over 100,000 kW. The Commissioners were anxious that such electrical works in the various electricity districts as were likely to be required at an early date should be put in hand without delay, both in the interests of the development of electricity supply and also as a means of affording a measure of relief for unemployment. The meeting appointed Alderman E. Huntsman (chairman of the Nottingham Corporation Electricity Committee) chairman of the Board, and Alderman Flint, of Leicester, vice-chairman, Mr. W. J. Board (Town Clerk of Nottingham) being appointed clerk.

The Engineers' Committee was elected, consisting of representatives of Derby, Leicester, Nottingham, Burton-on-Trent, the power companies, and two members representing Mansfield, Loughborough, Long Eaton, and the Melton Mowbray Electric Light Co. A General Purposes Committee to consider standing orders and other matters was also appointed.

EDINBURGH AND LOTHIANS.—*Order of Constitution.*—The Electricity Commissioners have submitted to the Minister of Transport for confirmation an order constituting, and giving effect to the scheme evolved for the reorganisation of electricity supply in the above-named area.

Ipswich.—YEAR'S WORKING.—The accounts of the Corporation electricity undertaking (engineer: Mr. A. S. Black) for the year ended March 31st last record a total income of £87,867, as compared with £82,188 in 1922-23. Working expenses amounted to £50,507, as against £44,874, leaving a gross profit of £37,360 (£37,314). Capital charges absorbed £26,677, and there was a net surplus of £10,683, as compared with £10,801 in the previous year. From this was deducted £896, being wages of permanent workmen on capital work, leaving £9,787 to be transferred to reserve. The capital expenditure during the year amounted to £21,047; this included £18,731 for mains, and the total now spent on the undertaking stands at £319,016. The electrical energy sold amounted to 6,828,129 kWh, an increase of 1,077,978 kWh. It has been decided to install a Clayton & Shuttleworth boiler in the boiler-house.

Irish Free State.—DUBLIN.—According to *The Times*, about 2,000 municipal employés came out on strike on July 26th, including the power station employés. It is stated that the dispute has arisen through a proposal to reduce the men's wages. These reductions were not to have been enforced until September.

OPPOSITION TO BILLS.—The Blackrock (Co. Dublin) Urban District Council has decided to present petitions against the Dublin Electricity Supply Bill, the East Leinster Electricity Supply Bill, and the Dublin Corporation's Electricity Supply Bill.

London.—STEPNEY.—*Year's Working.*—We have received from the borough electrical engineer, Mr. W. C. P. Tapper, a copy of the report on the electricity undertaking for the year ended March 31st last. The total income amounted to £261,283, as compared with £278,807 in 1922-23. Working expenses showed an increase at £148,373, as against £141,742, leaving a gross surplus of £112,910 (£137,066). Capital charges absorbed £77,997, and there was a net profit of £38,735, as compared with £65,645 in the previous year. The capital expenditure during the year amounted to £214,920, the chief items being £112,550 for machinery, and £51,116 for mains and services. The sales of electrical energy increased from 34,418,923 to 42,140,142 kWh, and the average price per kWh obtained decreased from 1.921d. to 1.476d. A 10,000-kW turbo-generator was put into commission in March last.

Manchester.—FUEL ECONOMY.—A quarterly return compiled by the Electricity Department shows that, as compared with the April-June quarter of last year, there has been a saving of 0.44 lb. of coal per kWh sold, the figure for last quarter being 2.33 lb. This economy has occurred at a time of higher prices, but in spite of these the saving has amounted to £8,328. This result is due, of course, to the improved efficiency brought about by the Barton station.

The return shows that the sales of energy (55.81 million kWh) exceed those of the equivalent quarter of 1920, the "boom" year, which was 51.10 million kWh.

LOAN.—Application is being made to the Electricity Commissioners for sanction to the borrowing of £50,000 for the equipment of distributing stations.

(Continued on page 185).

Electrically-Driven Belt Coal Conveyors.

The South Docks, Sunderland, Installation.

Two up-to-date steel-belt coal conveyors, driven by electricity, have been installed by the River Wear Commissioners at the Port of Sunderland to secure more rapid shipment of coal. Each conveyor is capable of delivering 1,500 tons of coal per hour into a suitable vessel and, together with the necessary railway extensions made by the London & North-Eastern Railway Co., the scheme has cost about £100,000.

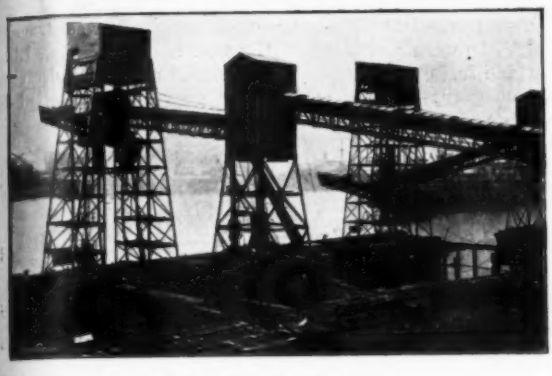


Fig. 1.—View of both Conveyors.

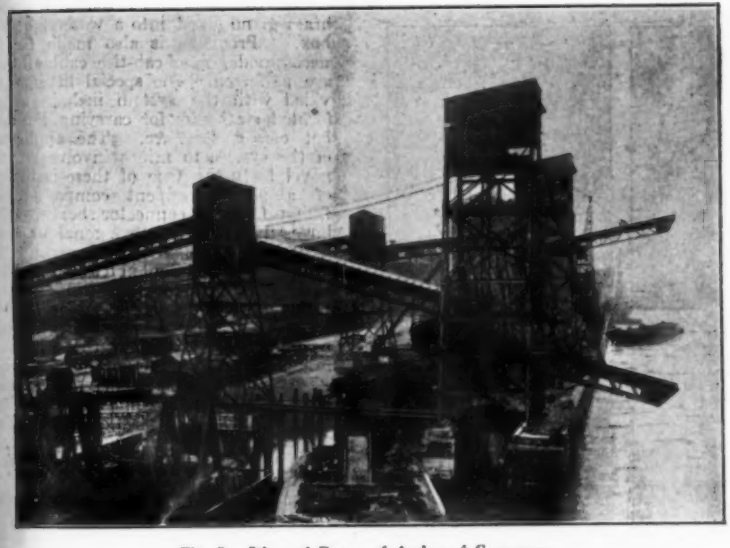


Fig. 2.—View of Range of Action of Conveyors.

The new appliances are situated at the north end of the South Docks in close proximity to the dock entrance, and are easy of access for incoming and outgoing vessels. Coal can be delivered by the L. & N.E. Railway direct on to the approach sidings from the south and west without shunting. The plant has been designed for the rapid loading of vessels with the minimum of breakage, and consists of two duplicate conveyors of the endless steel-belt type, each capable of delivering 750 tons per hour to the vessel. The conveyors are spaced 140 ft. apart in order to fit two holds of a moderate sized vessel.

The part of the conveyor at the shore end is of the fixed type, and the part next the shipping berth of the derricking jib type operated by electrical gear from the main towers. The outer end of the derricking conveyor is telescopic and capable of slewing through an angle of 10 deg. on either side of the centre line. Each conveyor is carried on built steel towers; the outer, or "main," tower is placed next the loading berth on the new quay, the inner or "conveyor" tower near the old quay, an intermediate tower supporting the centre of the fixed conveyor. A steel hopper of 35 tons capacity is located on the railway lines at the shore end of each conveyor, the following being the working conditions: Range of delivery end, from 10 to 60 ft. above water level; range of telescopic boom, from 18 to 30 ft. from quay line.

The derricking, or jib conveyor is pivoted at the inner end on the conveyor tower, the outer end being supported on a lifting frame in the main tower. This frame is raised or lowered to suit the different heights of vessels by an electric motor through heavy screw gear. The telescopic conveyor is supported on a shaft working in a slot between the delivery and return belts, and is fixed to the lifting frame. The telescopic adjustment to suit the different beams of vessels and to facilitate trimming is also operated by a motor through screw gear. With the exception of the wire ropes supporting the outer end of the telescopic conveyor, the use of wire ropes for the different adjustments has been eliminated as far as possible by the substitution of screw gear.

The belts consist of steel trays about 3 ft. 4 in. long and 12 in. wide, dished about 3 in. at the sides, connected together by steel links and supported on steel spindles having a roller at each end, travelling on rails, both on the delivery and return sides of the belt. The belt is operated by heavy steel sprocket wheels driven by an electric motor,

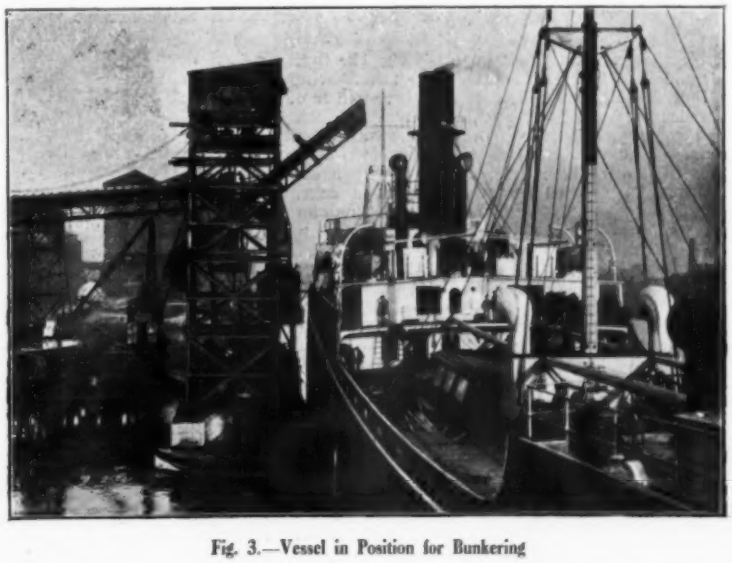


Fig. 3.—Vessel in Position for Bunkering

and steel guard plates riveted to the conveyor booms form a trough along which the coal is carried. Auto-

matic lubrication is used throughout, and all operations are controlled by one operator from the top of the main tower, electrical limit switches and cut-out gear being provided in case of overwinding or failure.

Automatic wagon-locking gear is provided on the hoppers; the empty railway wagon, on being released, passes over a pedal operating a chock which stops the following wagon in position for teeming. Standage sidings for 300 twenty-ton wagons have been laid out by the L. & N.E. Railway, and are claimed to form the most modern arrangement in the country. The engine and train are brought right up to the hopper, and by means of an engine road the engine leaves the loaded train ready for teeming, and goes into the empty sidings in position to pull out the empty wagons without shunting. By this arrangement considerable time is saved in the handling of the traffic to the staiths, and in the return of empty wagons to the colliery, which is the cause of so much delay at the present time. In order to expedite the shipment and to keep a continuous supply of coal on the belt, the hoppers are placed on the loaded lines; the wagons gravitate to the hoppers, after discharging to the light or empty lines.

A new quay wall has been built to form the shipping berth 400 ft. long, with a depth of 30 ft. of water at ordinary dock level. The new plant was built to the design of Mr. Allan Crombie, M.Inst.C.E., chief engineer to the River Wear Commissioners. The contractors for the work were Messrs. Cowans, Sheldon & Co., Ltd., Carlisle, constructional engineers, and the electrical equipment—motors and control gear—was supplied by the Metropolitan-Vickers Electrical Co., Ltd.

Some of the Exhibits at Wembley.

Messrs. W. T. Glover & Co., Ltd.

(Stand No. 30, Avenue 10, Bays 15-17.)

One of the principal items of interest upon this stand is a 33,000-V cable joint in various stages of progress; three of these stages are illustrated in fig. 168. The first view shows the glands and cores in place, the latter being kept apart by four insulating spreaders. About one inch of the copper test sheath is left bare, and about another inch of paper is left between the exposed sheath and the lead of the cable. In the second view the test sheath is shown bridged by about a dozen small copper wires, insulated with a double braiding of cotton and woven into the form of a cage. This cage work is impregnated with insulating compound before use, and is slipped over one side of the cable before the conductors are jointed. When this operation is completed the cage is bound down and sweated at one end (see the first view). It is then slipped over and bound down at the opposite end. A lead sleeve is then placed in position over the joint, and this is plumbed and filled with compound in the usual manner. The finished joint, with one-half of the outer shell and bonding cable in position, is seen in the third view. By this system the electrical continuity of the test sheath is assured; the main conductors are entirely sheathed by the test conductors at joints; and there is no obstruction to prevent the compound reaching all interstices. The test sheath enables insulation tests to be made while the cable is "alive" and in commission, and the condition of the insulation is thus observed at working pressures and under working conditions. Slight damage may thus be detected in the initial stages without interruption of the supply, and incipient faults can be repaired before they go too far.

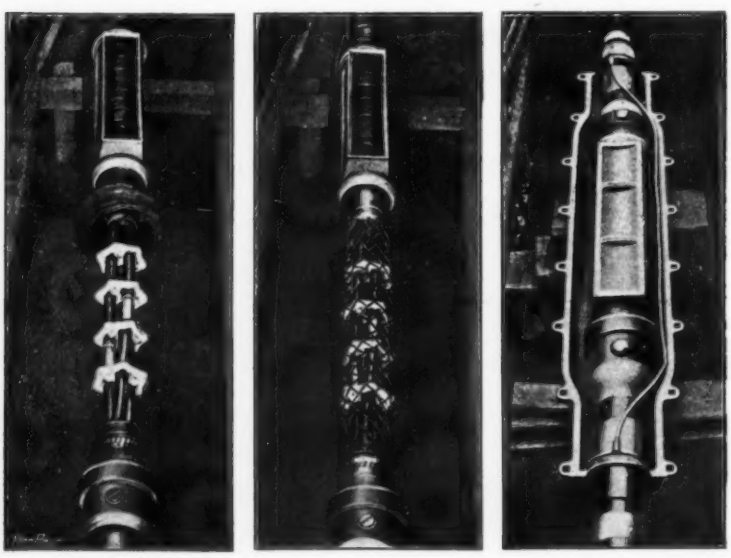
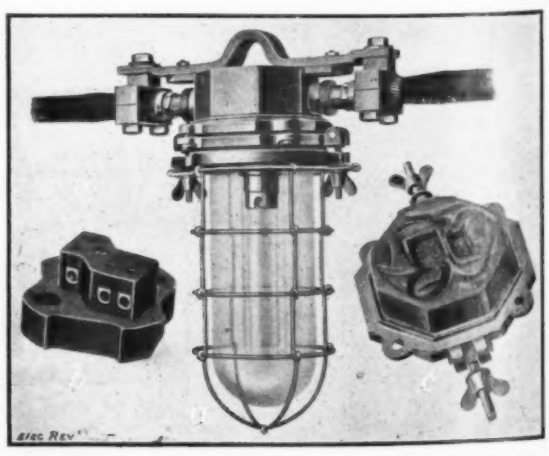


Fig. 168.—A; "Glover" 33,000-V Cable and Test Sheath Joint.

The "Glo-Clad" system of wiring is also shown. Although this has already been described in our pages, its salient points may again be mentioned. The system is especially suitable for industrial installations. The cable used is of the lead-alloy sheathed rubber-insulated type. At all junctions and terminals the cable is bonded and sealed by means of an internally screwed brass gland fixed into a watertight iron box. Provision is also made for the accommodation of cab-tire cables if these are preferred. The special fittings provided with the system include a perforated steel tray for carrying the cable between girders, &c. The application of the system to mines involves several novel features. One of these is the use of a plastic resilient compound plug filling for the connector boxes. The boxes themselves are octagonal in shape, and contain a base of fire-resisting insulating composition in two parts. The main part consists of an insulating diaphragm which separates wires of opposite polarity or phase, and a connecting block provided with a third terminal for looping-in or for a switch wire. In fig. 169, (a) is a typical lighting fitting; (*b*) is the connector base; and (*c*) is the block of plastic compound referred to above after being pressed into position by the lid of the box. Another important part of the system is the fuse arrangement. A typical distribution board is illustrated in fig. 170. The fuse is in three parts—a socket which fits on to the framework; a fuse plug in which effective arrangements are made for choking down the expanded gases resulting from an arc; and an internally fluted cover which is fastened to the socket by a bayonet arrangement. The fuse can only be disconnected or blown



(a) Lighting fitting; (b) connector base; (c) connector box and compound plug.

Fig. 169.—The "Glo-Clad" Wiring System for Mines.

when the cover is right "home." A special type of gland is provided for both metal-sheathed and c.t.s. cables, as well as a double-pole switch of express design.

A hydraulic tank for testing the lead sheathing of cables

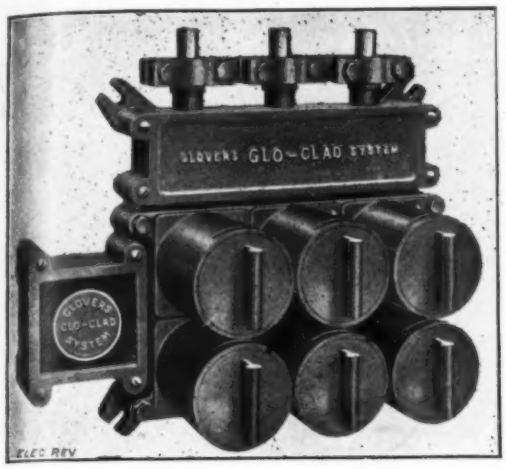


Fig. 170.—A "Glo-Clad" Distribution Board.

is another exhibit. The cable to be tested is placed in the tank (as shown in fig. 171) and subjected to a hydraulic pressure of about 100 lb. per sq. in. for five minutes. This test not only immediately reveals small pinholes, but also thin or weak places in the lead sheath, which would otherwise escape detection and lead to early faults in the cable. The tanks are made to accommodate drums up to 8 ft. in diameter.

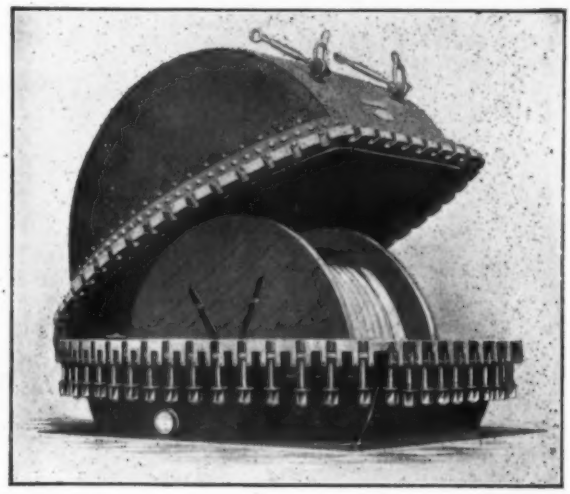


Fig. 171.—A "Glover" Hydraulic Cable Testing Tank.

The remainder of the exhibit comprises numerous sections of all types of the company's cables, pillars and joint boxes, and other cable accessories.

Messrs. Greenwood & Batley, Ltd.

(Stand No. 7, Avenue 7, Bays 20 and 21).

Amongst the non-electrical machinery on this firm's stand is an electrically-driven battery truck with which we propose to deal in a later issue, and also a 75-h.p. (50-kW) steam turbo-dynamo set, fig. 172, which is very useful for ship lighting and power installations generally. The turbine is of the single-stage De Laval type, with the wheel running at a speed of 16,500 r.p.m., this speed being reduced by double helical gearing to the dynamo speed of 1,500 r.p.m. The dynamo is level compound-wound for 110 volts. A centrifugal governor and double-beat governor valve are fitted so as to control the speed within 2½ per cent. from full to no load. The turbine bearings and gearing are fitted with a complete system of forced lubrication, the oil pump being mounted in the bedplate and driven by a worm wheel from the geared shaft. The oil is pumped to the gearing and bearings through an efficient cooler and then gravitates to a tank in the bed-plate before being used again by the pump. A smaller turbine of the same type is shown coupled direct to a blower, the arrangement being similar to that adopted in many gasworks in connection with water-gas plant.

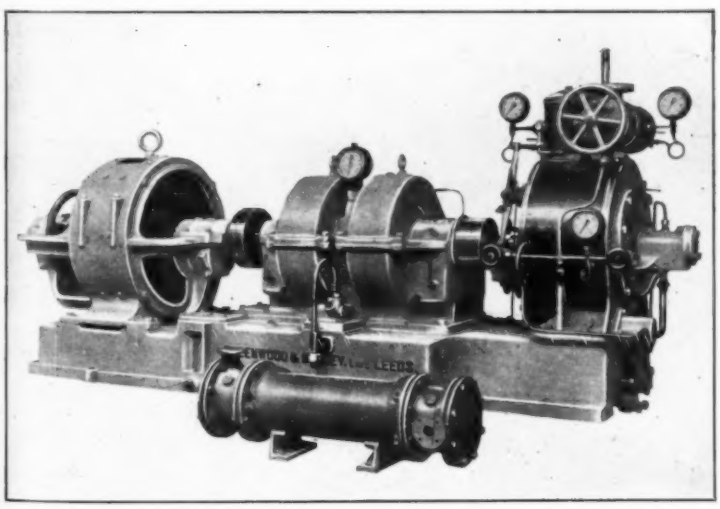


Fig. 172.—Greenwood & Batley 50-kW Turbo-dynamo.

Another exhibit is illustrated in fig. 173, being a ventilated, enclosed, slip-ring induction motor of from 720 to 750 r.p.m., fitted with completely enclosed dust-proof slip rings, together with short-circuiting gear and also interlocks for the starting pillar. The motor is fitted with ball and roller bearings. An 8-h.p. d.c. motor which is shown is designed for colliery use and has mainly been used in connection with underground conveyor work. The machine is flame-proof, the whole of the frame and end shields being of steel and capable of withstanding an internal explosion without damage.

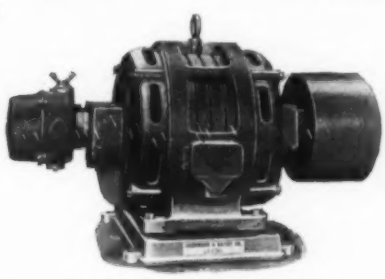


Fig. 173.—Greenwood & Batley 25-h.p. Slip-ring Motor.

Messrs. Cole, Marchent & Morley, Ltd.

(Stand No. 25, Avenue 10, Bay 5.)

The central exhaust, or "Uniflow" engine, exhibited on this stand (fig. 174) is the latest development in steam engine practice, and is essentially suitable for mill driving, refrigerating plant, ventilating fans for mines, air compressors, pumping plant, and for driving d.c. and a.c. generators for electricity supply.

Many improvements have been included, and one of the principal ones is the use of the C.M. & M.-Delas steam jet air extractor as part of the condensing plant, this being the outcome of the firm's experience in supplying this particular product for power station work and other purposes where high efficiency is required. Other features in the design are spherical swivel main and outer bearings, positive opening and closing of valve gear, and a patent piston of a special type which ensures absolute freedom from any tendency to distortion or knock. Forced lubrication is provided throughout.

The control handwheels are arranged on a pillar one above the other in such a way that they operate the various valves, &c., in the order of starting up.

The engine shown on the stand develops normally 410 i.h.p. when running at 165 r.p.m. It is suitable for a boiler pressure of 160 lb. per sq. in. and for using steam superheated to a total temperature of 575 deg. F. The diameter of the cylinder is 24 in., and the stroke is also 24 in.

Other exhibits include models of some of the minor products of the firm, and include an oil cooler, air cooler, refrigerating plant, and vacuum drying plant, the first two being of especial interest to power engineers for use with turbines and other installations, and the last two are adaptations of the C.M. & M.-Delas air extractor.

The principal features of the oil cooler are the methodical method of cooling and the ease of dismantling for cleaning. A series of nests of tubes fit into a similar set of larger tubes with closed ends in such a way that the oil is cooled while circulating between the tubes. The air cooler is of the closed circuit type, and water is circulated through gilled tubes which form the cooling surfaces. Groups of these tubes are placed between two waterheads which are specially baffled to allow the water to circulate the required number of times.

The refrigerating plant works on the water evaporation principle, brine being used, and consists of an evaporator, air extractors, and a condenser. Brine falls through the evaporator in the form of a spray, the air extractors at the same time creating a vacuum so that the brine is cooled by evaporation as it falls. In the vacuum drying plant an air extractor forms the vacuum-producing apparatus.

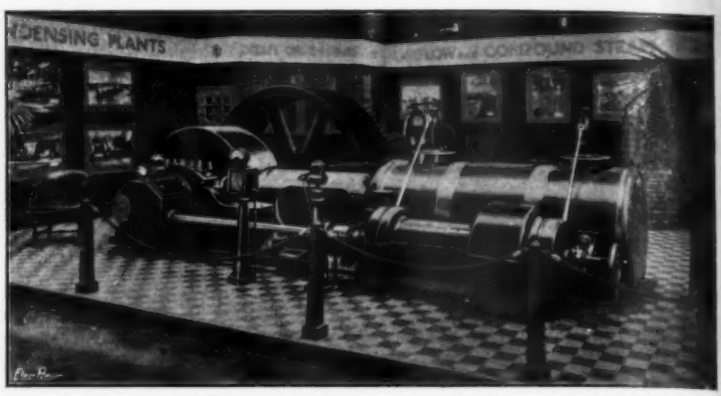


Fig. 174.—A Cole, Marchent & Morley "Uniflow" Engine.

Messrs. W. H. Allen, Sons & Co., Ltd.

(Stand No. 9, Avenue 8, Bays 22 and 23.)

On this stand is an engine, of which fig. 175 is an illustration, suitable for marine auxiliary purposes; it is of the two-cycle vertical two-cylinder type, rated at 60 b.h.p. for running with residual oils as fuel. The amount of fuel injected is automatically regulated by the governor in accordance with the power required, surface ignition is employed, and under no conditions of working is water injection required. Each cylinder is fed at four points with oil from a mechanical lubricator, and similar engines are built with one, two, or four cylinders, ranging from 15 to 200 b.h.p.

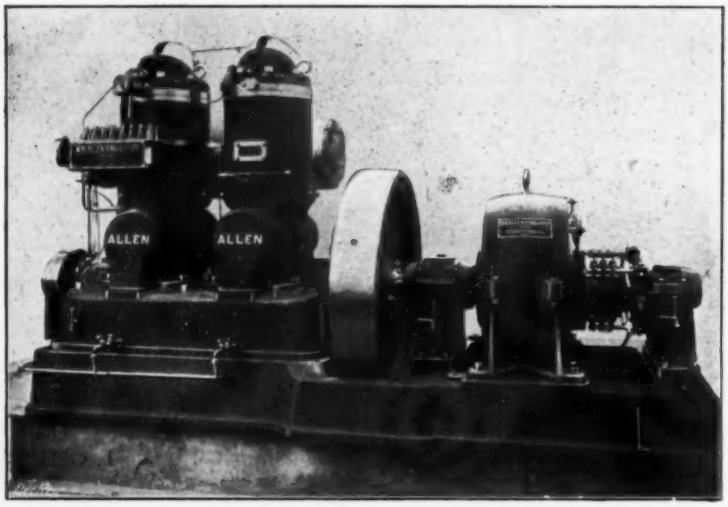


Fig. 175.—Allen Heavy Oil Engine and Dynamo.

The 36-kW dynamo is of the "Allen" d.c. multipolar compound-wound interpolar type, suitable for a pressure of 220 volts, and runs at a speed of 325 r.p.m.

A 250-kW steam turbo-driven d.c. generator is shown in which the dynamo is driven through reduction gearing, and is capable of developing an overload up to 312 kW for a period of two hours. The turbine is of the impulse type, runs at a speed of 6,000 r.p.m., and has two wheels, the first of which has two rows of blades and the second one row. The governor is of the centrifugal type, operating the throttle valve through an oil relay, and an emergency governor is also fitted. The turbine is arranged for exhausting against a back pressure of 20 lb. per sq. in. above atmosphere.

The gearing, which reduces the speed of the turbine to that of the generator, *i.e.*, 650 r.p.m., is of the double-helical type; the pinions are made of nickel steel forged solid with the shaft, the main gear wheels consisting of cast-iron hubs with mild steel rims shrunk and pinned on.

A two-cylinder, compound vertical engine, of the enclosed forced-lubrication type, is shown coupled to a compound-

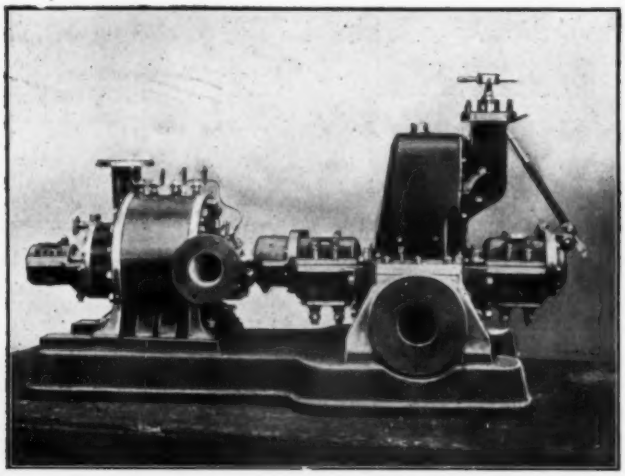


Fig. 176.—Allen Turbo Boiler Feed Pump.

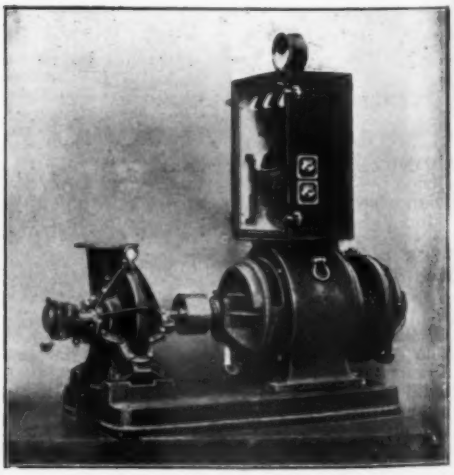


Fig. 177.—Allen Marine Pump.

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wound, interpolar dynamo with an output of 100-kW at 500 revolutions a minute.

A turbo-driven boiler-feed pump, fig. 176, is usually made up in two or more stages to obtain the comparatively moderate running speed necessary for plant which is in constant operation. The turbine is of the impulse type, and the speed of the unit may be varied automatically so as to give a constant pressure on the discharge branch of the pump, with a very wide range of quantity of water delivered. It is also fitted with an emergency governor of the unbalanced ring type.

The marine circulating and sanitary pump shown in fig. 177 has a casing and impeller of gun-metal, and the shaft is gun-metal sheathed where it is in contact with water. The example shown is designed to deliver 400 gallons of water per minute against a 70-ft. head, the speed being 1,300 r.p.m. At this duty the efficiency of the pump is 67½ per cent. The oblique split of the pump casing combines the advantages of the vertical discharge branch position so convenient for this class of pump, with facilities for easy inspection or removal of the pump rotor without breaking pipe joints.

An Allen surface condenser is also exhibited, as well as an Allen Diesel engine, which is of the Burmeister and Wain design, and has an output of 320 b.h.p. when running at 200 r.p.m.

Lighting and Power Notes.

(*Continued from page 180.*)

Cheadle and Gatley.—LOAN.—The Urban District Council has decided to apply to the Electricity Commissioners for sanction to a loan of £5,555 for the Bird Hall Lane extension. The mains are also to be extended to the Pendlebury estate at a cost of £880.

Dalbeattie.—ELECTRICITY SCHEME.—The Town Council has approved of an electric lighting scheme by a private company. Overhead wires are to be used.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

KING'S LYNN.—Lighting: 5½d. per kWh. Heating: Summer quarters, 1½d. per kWh; winter quarters, 1¾d. per kWh. Power: A sliding scale of from 2½d. to 1¼d. per kWh, with a discount of 40 per cent. in all cases.

WILLESDEN.—Lighting: Flat rate of 4½d. per kWh. Domestic heating: 1d. per kWh. Combined domestic lighting and heating: 4½d. per kWh up to a minimum, and 1d. per kWh thereafter. Industrial power and heating: varying from 1.5d. per kWh for less than 100 kWh per h.p. consumed per quarter to 1d. per kWh for all energy over 250 kWh per h.p. Large consumers: a fixed charge of £1 per kW per quarter, plus a "unit" charge varying from .9d. up to 5,000 kWh, to .7d. per kWh for all energy exceeding 30,000 kWh.

WORKSOP.—Lighting: a reduction of ½d. per kWh. Power: a reduction of ¼d. per kWh.

HAMPSTEAD.—Lighting: From 5d. to 4d. per kWh. Power, heating, and cooking: From 1½d. to 1d. per kWh.

Radcliffe (Lancs.).—LOAN.—The Urban District Council is applying to the Electricity Commissioners for sanction to the borrowing of £17,583 for plant and mains.

Runcorn.—SPECIAL ORDER.—The Electricity Commissioners have granted a Special Order to the Mersey Power Co., Ltd., authorising it to supply electricity in bulk to the North Wales Power Co., Ltd.

Southport.—YEAR'S WORKING.—The report of the borough electrical engineer (Mr. E. Moxon) for the year ended March 31st last states that the total income of the electricity undertaking amounted to £84,077, as compared with £80,151 in the previous year. Working expenses totalled £38,910, as against £33,733, leaving a gross profit of £46,867 (£46,418). After deducting capital charges, there was a net profit of £18,22[illegible], as compared with a surplus of £15,914 in 1922-23. It is recommended that the surplus be distributed as follows:—£1,6[illegible], outstanding debit balance; £500, tramway feeder renewals; £5,000 to reserve; £11,029 to appropriation account. The Council has entered into an agreement with the Birkdale District Electricity Supply Co. for the provision of a bulk supply to the company for a period of not less than 15 years, the agreement to come into operation on or before January 1st, 1925.

Thornton.—PROPOSED BULK SUPPLY.—The Urban District Council proposes to obtain a bulk supply of electricity from the Fleetwood Council, and has requested that authority to submit terms for such a supply.

United States.—ELECTRICAL DEVELOPMENT.—According to *Power*, the first two sets of the Wabash River power station of the Indiana Electric Corporation were brought into operation on July 8th. The total capacity of these sets is 55,000 h.p. Additional plant is to be installed bringing the total capacity of the station up to 135,000 h.p. Electricity is supplied to Indianapolis and 127 other towns in Indiana. The cost of the scheme, when completed, will be $12,000,000.

HYDRO-ELECTRIC DEVELOPMENT.—According to the *Electrical World*, the Pacific Gas and Electric Co. and the Nevada (Cal.) Irrigation District have concluded 18 months' negotiations for a joint hydro-electric and irrigation development in Nevada and Placer Counties, which will cost about $8,000,000, and joint application for approval has been made to the California Railroad Commission.

West Ham.—YEAR'S WORKING.—The report of the engineer and manager of the borough electricity undertaking (Mr. F. W. Purse) for the year ended March 31st last has come to hand. The total revenue amounted to £358,896, as compared with £357,369 in 1922-23. Working expenses were £250,251, as against £244,710, leaving a gross profit of £108,645 (£112,659). Interest absorbed £48,117, and principal repaid amounted to £38,951, leaving a net surplus of £21,577, as against a profit of £40,776 in the previous year. During the year £81,679 was spent on capital account, the chief items being £39,022 for mains and services and £33,920 for machinery. The electrical energy sold increased from 45,762,034 to 50,612,888 kWh, and the price per kWh obtained decreased from 1.73d. to 1.58d. The maximum supply demanded rose from 17,080 to 19,040 kW. A second 10,000-kW set was completed and put into commission during the year, and proposals are under consideration for the installation of a third set of similar capacity. The laying of the necessary cables in connection with the bulk supply to Ilford is proceeding, and it is anticipated that the supply will be available during the coming winter. It is also proposed to connect the Council's power station with that of Poplar, and if this is carried out the following stations will all be interconnected:—Ilford, East Ham, West Ham, Poplar, Stepney, Hackney, Shoreditch, and Islington.

Willesden.—YEAR'S WORKING.—The report of the electrical engineer, Mr. A. W. Blake, on the working of the electricity undertaking for the year ended March 31st last shows a total revenue of £118,492, as compared with £108,812 in the previous year. Working costs, including the purchase of a bulk supply from the North Metropolitan Power Supply Co., Ltd., amounted to £82,975, as against £68,780, leaving a gross surplus of £35,517 (£40,032). After deducting capital charges there was a net profit of £8,402, as compared with a profit of £13,627 in 1922-23. This was carried to appropriation account together with a balance from the previous year of £18,654, making a total of £27,057, which was disposed of as follows:—Loan repayment, £5,000; special loan repayment, £12,000; reserves, £5,500; changing over from d.c. to a.c., £1,000; balance carried forward, £3,556. The capital expenditure during the year amounted to £47,301, the largest single item being £31,891 for mains and services. The sales of energy increased from 9,507,066 to 12,590,487 kWh.

Workington.—ELECTRICITY SUPPLY.—The Town Council has entered into an agreement with the Workington Electric Power Co., for a supply of electricity to the borough. The cost of the scheme is estimated at £7,724.

Tramway and Railway Notes.

Continental.—CZECHO-SLOVAKIA.—The Reichenberg-Gablonz-Tannwald Railway Co., which operates about 25 miles of railway in the textile manufacturing region of Northern Bohemia, is contemplating the electrification of its entire line. The cost of the scheme is estimated at 27,000,000 Czech crowns. The railway crosses mountainous country and includes a rack-rail section.

RUSSIA.—The directors of the Société des Tramways et Electricité en Russie, of Brussels, in their report for the year ended April 30th, state that they are still without any news of their electric tramway undertaking in Simferopol and the tramway and telephonic system in Odessa, these still being in the hands of the Soviet Government. As regards the Société des Tramways de Riga, the system is now being worked in accordance with a new agreement with the municipality, and although the traffic is as yet only 75 per cent. that of pre-war, a slight profit, it is stated, is being made. During the past year the work of constructing two sub-stations in the town was commenced, and one of these is now approaching completion. The municipal authorities of Riga have, however, given notice of their intention to exercise their right to purchase and take over the tramway system as from January 1st next, and negotiations are now in progress.

Dutch East Indies.—JAVA.—A commencement is being made with the electrification of the State railways in Java, with the Metropolitan and suburban lines in Batavia. The power will be supplied from a hydro-electric station of a capacity of 7,500 h.p. Two sub-stations are to be established where the 70,000 V current will be transformed to 1,500 V d.c. The high-pressure transmission line will be about 56 miles in length.

London.—EDGWARE TUBE EXTENSION.—The new tube extension from Hendon to Edgware will be opened for traffic on August 18th. The length of new line is three miles.

PROPOSED NEW TRAMWAY.—The Highways Committee of the L.C.C. has recommended that Southend Village, Catford, be connected with Eltham by a tramway system. The estimated cost of the scheme is £303,735.

Exeter.—YEAR'S WORKING.—The report of the general manager of the Corporation tramways undertaking (Mr. R. O. Baldwin) for the year ended March 31st last shows a total revenue of £39,521, as compared with £38,607 in 1922-23. Working expenses amounted to £28,647, as against £29,874, leaving a gross profit of £10,873 (£8,733). Capital charges absorbed £6,787, and there was a net surplus of £4,087, as compared with a profit of £2,587 in the previous year. The number of passengers carried increased from 5,848,394 to 6,400,389, and the car-miles run from 460,623 to 483,761.

Ipswich.—YEAR'S WORKING.—The report on the working of the Corporation tramway undertaking (manager, Mr. A. S. Black) for the year ended March 31st last shows a total revenue of £42,348 (railless cars £2,111), as compared with £43,300 in the previous year. Working expenses totalled £35,254 (railless cars £1,915), leaving a gross profit of £7,094 (£3,879). After deducting bank interest and interest on loans, a balance of £3,495 was carried to the appropriation account. To this a balance from the previous year of £2,568 was added, together with £2,800 from the borough fund, and a sum of £5,302 was used for debt redemption and special expenditure, leaving a balance of £3,561 to be carried forward. The number of passengers carried increased from 5,541,339 to 5,719,168, and the car-mileage from 577,493 to 587,348.

Portsmouth.—TRAMWAY SUPPLY.—The joint sub-committee of the Corporation Tramways and Electric Lighting Committees has under consideration the advisability of the tramway undertaking obtaining electrical energy from the main generating station instead of generating its own electricity, and the Electric Lighting Committee has been requested to furnish particulars as to the cost and under what conditions it would be prepared to give a supply.

Telegraph and Telephone Notes.

France.—IMPATIENCE PENALISED.—An ingenious administration has decided to add yet another trial to the many already borne with humble resignation by Parisian telephone subscribers, states the *Daily Telegraph's* Paris correspondent. In future, when a subscriber calls the exchange, a number will appear over his disk on the operator's board to indicate his turn in the waiting list. As each appeal is answered, the subscriber who started twelfth in order will gradually move nearer to number one, but should he, in protest against delay, tap the hook, the number of his turn will automatically disappear, and he will have to begin again at the end of the waiting list.

Imperial Radio Communication.—THE "BEAM" SYSTEM.—The Government has definitely decided to investigate the merits of short-wave directional, or "beam," radio-telegraphy and for this purpose has arranged for the Marconi Co. to erect a station of this type for communication with Canada (in the first place), and, later, with Australia, India, and South Africa. The terms of the contract are such that payment for the station is contingent upon its success. The Postmaster-General has decided that for strategic and other reasons it will still be necessary to proceed with the erection of a high-power station. Australia and Canada have decided to build "beam" stations for communication with this country, and the Wireless Telegraph Co. of South Africa is also to proceed with a similar station immediately. The new station is to cost a maximum of £58,000 in the first instance; the provision of additional plant for communication with Australia and South Africa would cost a further £36,000 (maximum).

NEW CANADIAN RADIO STATIONS.—As a result of arrangements made between the British Government, the Canadian Department of Marine and Fisheries, and the affiliated Marconi companies, radio stations will be established near Montreal and Vancouver as links in the Empire radio "chain." The stations will be owned and operated by the Marconi Wireless Co., of Canada, will have a guaranteed operating speed of a hundred words a minute, and will cost approximately three hundred thousand dollars each. Licences have been issued by the Canadian Department of Marine permitting the Marconi Co. to proceed with the work.—*Reuter* (Ottawa).

Spain.—PROPOSED TELEPHONE EXTENSIONS.—*Commerce Reports* states that representatives of an American corporation are considering the extension of telephone service in Spain and the installation of automatic telephones in the larger cities. Conferences are being held with Spanish financial interests to obtain the capital needed for the enterprise. The project now considered will require a total capital of about 1,000,000,000 pesetas to be paid in at the rate of approximately 50,000,000 pesetas annually.

Switzerland.—NEW STATION.—Work has been commenced on the erection of the antenna tower at the new radio transmission station at Hongg, near Zurich. The tower, which will be constructed of steel, will be 213 ft. high, and in order to warn aviators of the existence of the tower it is to be painted in red and white, while four red lamps at the apex are to be kept illuminated at night.

Radio Notes.

Agricultural Information.—FORTNIGHTLY BULLETINS.—From the beginning of October the Ministry of Agriculture has arranged with the British Broadcasting Co. to issue from London a regular fortnightly bulletin containing information designed mainly to assist and interest agriculturists and others concerned in the land and its cultivation. About 15 minutes will be devoted to each message.—*The Times.*

United States.—BROADCASTING FROM THE SEA-BED.—The New York correspondent of the *Daily Telegraph* states that Messrs. Gimbel Bros., the prominent American merchants, have a station upon the steel pier at Atlantic City, New Jersey, and they have arranged for a deep-sea diver, "with a descriptive and literary gift," to go down to the ocean bed about a mile out and "deliver the goods." This is considered to be well within the power of modern radio equipment. Through the heavy glass windows of his helmet he will see and describe the sub-sea floor formation, marine flora, strange fish.

Contracts Open and Closed.

(The date given in parentheses at the end of the paragraph indicates the issue of the ELECTRICAL REVIEW *in which the "Official Notice" appeared in our advertisement pages.)*

Open.

Argentina.—BUENOS AIRES.—October 16th. Argentine National Sanitation Works Department. Hydro-electric plant for Mendoza, including turbines, 3-phase a.c. generators, switchboard, &c.*

Australia.—SYDNEY.—October 15th. New South Wales Government Railways and Tramways Department. 20,000-kW turbo-alternator for White Bay.*

August 11th. Public Works Department. 66,000-V insulators for the Barren Jack hydro-electric scheme.*

September 15th. Postmaster-General's Department. Motor generator sets.*

MELBOURNE.—August 27th. Victorian Railways. 7-ton electric travelling crane, 3-motor type, complete with electric lifting magnets and equipment.

September 9th. Postmaster-General's Department. Switchboard cords.*

Aylesbury.—Electricity Department. Erection of 11,000-V .05 sq. in. overhead transmission line. (July 18th.)

Ayr.—Electric lighting installation at Stewarton Hospital. Burgh surveyor.

Barnstaple.—August 1st. Secretary, West Buckland School. Complete electric lighting installation at the school. (July 25th.)

Bedford.—August 11th. Electricity Department. Water-tube boiler, stoker, draught plant and accessories. (July 18th.)

Belfast.—August 18th. Electricity Department. Motor generator and transformers. (July 25th.)

Birmingham.—August 30th. Salvage and Stables Committee. Plant for refuse disposal and salvage works. (For particulars see issue of July 25th.)

Cleckheaton.—August 1st. Hospital Board. Electric lighting installation at North Bierley Joint Hospital, Oakenshaw Lane. Specifications from Mr. W. H. Clough, clerk to the Hospital Board, 1, Northgate, Cleckheaton.

Dublin.—August 9th. Electricity Department. Transformers and single-phase, three-phase, and slot meters for 12 months. (July 25th.)

August 19th. Town Council. Two electrically-driven air compressors, &c. Specification from the City Treasurer, Exchange Buildings, Lord Edward Street, Dublin.

August 6th. Electricity Department. Capping and casing and wire required. Specifications from City Electrical Engineer.

Glasgow.—August 2nd. Health Department. Electric lighting, &c., at pavilions at Bellefield Sanatorium. Particulars from Public Works Department, City Chambers.

Harrogate.—August 9th. Electricity Department. One 3,000-kW turbo-generator. (July 18th.)

Heywood.—August 7th. Electricity Department. L.h.p. and l.p. cables. (July 25th.)

Howth.—August 1st. Urban District Council. Electric lighting works in the urban districts of Howth and Sutton. Specifications and conditions from Mr. F. Higginbotham, town surveyor, 24, Nassau Street, Dublin.

Looe.—August 16th. Urban District Council. Supply of electricity in the district. (July 25th.)

Manchester.—August 12th. Tramways Committee. Permanent-way special track work. Mr. Henry Mattinson, general manager and chief engineer, Corporation Tramways, 55, Piccadilly, Manchester.

Newcastle-on-Tyne.—August 15th. Tyne Improvement Commission. 10-ton overhead electric travelling crane. Specification from Messrs. Cackett & Burns Dick, Pilgrim House, Pilgrim Street.

Newport (Mon.).—August 25th. Corporation Electricity Department. 10,000-kW turbine, &c.; 10,000-kW turbo-alternator, &c.; and surface condensing plant, &c. (See this issue.)

New Zealand. — WELLINGTON.—September 2nd. Public Works Department. Transformers and 11,000-V switchgear and metering apparatus for the Mangahao power scheme.*
September 23rd. Public Works Department. Waikato electric power scheme. Section 52, spillway regulating gates.*

Portsmouth. — August 5th. Tramways Committee. Stores, &c., for 12 months, including insulating materials, lamps, overhead line materials, &c. (July 18th.)

Southampton.—August 26th. Electricity Works. Two water-tube boilers, complete with superheaters, chain-grate stokers, economisers, mountings, induced-draught fans, steel chimney, steam, feed-water, and other piping, &c. (July 25th.)

South Africa.—JOHANNESBURG.—August 23rd. Municipal Council. 42 current transformers.*
September 26th. Rand Water Board. Two centrifugal pumps and motors. (Contract No. 258.)*

Uruguay.—MONTEVIDEO.—September 10th. State Electricity Department. Insulators, &c.*
September 15th. 37,750 iron supports for aerial wires.*
September 23rd. 60,000 metallic and carbon filament lamps.*

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Closed.

Australia.—SYDNEY, N.S.W.—City Council. Accepted:—
Battery separators, &c. (£743).—Tudor Accumulator Co., Ltd.
Step-down transformers and induction regulators (£13,469); l.p. cables (£4,300).—Johnson & Phillips, Ltd.—*Tenders.*

Belgium.—Three British firms—Callender's Cable and Construction Co., Ltd., the British Insulated & Helsby Cables, Ltd., and Fuller's United Electric Works, Ltd.—competed last week for three of the lots of miscellaneous electrical material required by the municipal authorities of Schaerbeek, Brussels. The lowest prices were, however, submitted by Belgian firms.

Chatham.—Messrs. G. E. Taylor & Co., of London, have secured the contract for re-wiring and making good electrical defects at the Royal Naval Barracks at Chatham.

Eastbourne.—Town Council. Recommended:—
Lift (£332).—Waygood-Otis, Ltd.

Government Contracts.—The following Government contracts were placed during June, 1924:—

ADMIRALTY CONTRACT AND PURCHASE DEPARTMENT.
Booster, control gear and spares.—Laurence, Scott & Co., Ltd.
Condensers.—H. W. Sullivan, Ltd.
Turbo fans.—Yarrow, Ltd.
Galvanometers.—Elliott Bros. (London), Ltd.
Motor generators.—Newton Bros. (Derby), Ltd.; Bull Motors, Ltd. Sub-contractors for switchgear: E. N. Bray, Ltd.; Small Electric Motors, Ltd.
Switches.—Whipp & Bourne, Ltd.; Veritys, Ltd.; Player & Mitchell, Ltd.; Westminster Engineering Co., Ltd.; Johnson & Phillips, Ltd.
Testing set.—Everett, Edgcumbe & Co., Ltd.
Conduit tubing.—General Electric Co., Ltd.
Tuners.—H. W. Sullivan, Ltd.

WAR OFFICE.
Electric lamps.—General Electric Co., Ltd.; Siemens & English Electric Lamp Co., Ltd.; Stella Lamp Co., Ltd.
Wireless valves.—General Electric Co., Ltd.
Electric wire.—W. T. Glover & Co., Ltd.
Installation of electric light at Weedon.—Tredegars, Ltd.

AIR MINISTRY.
Electric cable.—Siemens Bros. & Co., Ltd.
Rewinding generators.—Electric Construction Co., Ltd.
Belt-driven generators.—Evershed & Vignoles, Ltd.
Magnetos and spares.—British Thomson-Houston Co., Ltd.; Simms Motor Units, Ltd.

POST OFFICE.
Telegraph apparatus.—Siemens Bros. & Co., Ltd.
Telephone apparatus.—Automatic Telephone Manufacturing Co., Ltd.; British Insulated & Helsby Cables, Ltd.; British L. M. Ericsson Manufacturing Co., Ltd.; General Electric Co., Ltd.; Phœnix Telephone and Electric Works, Ltd.; Siemens Bros. & Co., Ltd.; Sterling Telephone and Electric Co., Ltd.; T. Watson; Western Electric Co., Ltd.
Testing and protective apparatus.—Chamberlain & Hookham, Ltd.; Edison Swan Electric Co., Ltd.; Everett, Edgcumbe & Co., Ltd.; Evershed & Vignoles, Ltd.; General Electric Co., Ltd.; International Electric Co., Ltd.; Phœnix Telephone and Electric Works, Ltd.; Power Equipment Co., Ltd.; Siemens Bros. & Co., Ltd.; Maple & Co., Ltd.
Wireless apparatus.—H. W. Sullivan, Ltd.
Battery boxes.—W. Duncan Tucker & Sons, Ltd.; Siemens Bros. and Co., Ltd.
Various cable.—British Insulated & Helsby Cables, Ltd.; Callender's Cable and Construction Co., Ltd.; Connollys (Blackley), Ltd.; Enfield Cable Works, Ltd.; General Electric Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Siemens Bros. and Co., Ltd.; Telegraph Construction and Maintenance Co., Ltd.; Union Cable Co., Ltd.
Loading coils.—Western Electric Co., Ltd.
Electric light fittings.—Engineering and Lighting Equipment Co., Ltd.; General Electric Co., Ltd.
Dials.—G. Jennings; J. Oakes & Co.
Lamps.—General Electric Co., Ltd.
Earth plates.—Bullers, Ltd.
Soft copper wire.—Enfield Cable Works, Ltd.
Flameproof wire.—Macintosh Cable Co., Ltd.; Receiver of H. W. Smith and Co. (1920), Ltd.
Manufacture, supply, drawing-in and jointing cable.—Newcastle-South Shields: Johnson & Phillips, Ltd.
Telephone exchange equipment.—Charing Cross Electricity Supply Co., Ltd. W.C.2: Relay Automatic Telephone Co., Ltd.; Achille Serre, Ltd. E.9: Relay Automatic Telephone Co., Ltd.; Jaeger & Co., Ltd. Milton Street, E.C.2: Relay Automatic Telephone Co., Ltd. Hoylake: General Electric Co., Ltd. (Sub-contractors for batteries: Tudor Accumulator Co., Ltd. For charging and ringing machines: Crompton & Co., Ltd.). Annfield (Liverpool): Western Electric Co., Ltd.

CROWN AGENTS FOR THE COLONIES.
Battery materials.—Siemens Bros. & Co., Ltd.
Electric cable.—Callender's Cable and Construction Co., Ltd.
Submarine cable.—Telegraph Construction and Maintenance Co., Ltd.
Electric cranes and hoists.—Sir W. Arrol & Co., Ltd.
Railway electric staff instruments.—Railway Signal Co., Ltd.
Railway signalling materials.—General Electric Co., Ltd.; Tyer & Co., Ltd.
Telegraph line materials.—Bullers, Ltd.
Telegraph apparatus.—British L. M. Ericsson Manufacturing Co., Ltd.
Telephone cable.—British Insulated & Helsby Cables, Ltd.
Telephone sets.—Western Electric Co., Ltd.
Tonum cells.—J. Stone & Co., Ltd.
Copper line wire, &c.—F. Smith & Co., Ltd.

Hull.—Corporation. Tramways Committee.
1,500 tons of rails (£17,936).—Bolckow, Vaughan & Co., Ltd. *The Times* states that a German tender was £9,000 less, and a Belgian tender £2,700 cheaper, but the Committee felt that the work should be kept in this country.

London.—STEPNEY.—Electricity Supply Committee.

Electrically-driven sinking pump.

Submersible Motors, Ltd. (Accepted.)	£132 (*a*)
	284 (*b*)*
Sandycroft, Ltd.	211 (*a*)
	257 (*a*)
Worthington-Simpson, Ltd.	251 (*a*)
	258 (*a*)
Boving Engineering Works, Ltd.	237 (*a*)
	265 (*a*)
Mather & Platt, Ltd.	294 (*a*)
Pulsometer Engineering Co., Ltd.	301 (*a*)
Drysdale & Co., Ltd.	377 (*b*)

(*a*) Not submersible. (*b*) Submersible.

Steelwork at Limehouse generating station.

Redpath, Brown & Co., Ltd. (Accepted.)	**£161**

Disconnecting boxes.

W. Lucy & Co., Ltd. (Accepted.)	**£341**
Universal Electrical Manufacturing Co.	370
British Insulated & Helsby Cables, Ltd.	610
W. T. Henley's Telegraph Works Co., Ltd.	683

Chamber frames and covers.

A. C. Woodrow & Co. (Accepted.)	**£97**

Electrically-driven boiler-tube scaling apparatus.

Liverpool Patents Co., Ltd. (Accepted.)	**£62**

Steam pipework at Limehouse generating station.

	Alternative (*a*).	Alternative (*b*).
Foster Bros., Ltd. (Accepted.)	**£9,088**	**£7,684**
John Spencer, Ltd.	8,610	8,050
Babcock & Wilcox, Ltd.	8,560	—
Stewarts & Lloyds, Ltd.	9,762	9,110
Vickers-Spearing Boiler Co., Ltd.	9,431	9,376

Steelwork for Osborn Street sub-station.

Joseph Westwood & Co., Ltd. (Accepted.)	**£342**

ST. MARYLEBONE.—Electric Supply Committee. Recommended:—
Water-softening and filtration plant (mainly of ferro-concrete construction) (£5,397).—Bowes, Scott & Western, Ltd.

ST. PANCRAS.—Electricity and Public Lighting Committee. Recommended:—
L.p. switchboards for the Highgate sub-station and the Regent's Park power station (£1,004).—Edison Swan Electric Co., Ltd.
Telpher machine for the King's Road power station (£1,075).—Strachan and Henshaw.
Two boilers and accessories, with "Lopulco" pulverised fuel system (£13,739).—The Vickers-Spearing Boiler Co., Ltd.

Manchester.—Electricity Committee. Accepted:—
Steam heating pipes.—Foster Bros., Ltd.
350 street lighting lanterns, globes and lampholders.—Cable Accessories Co., Ltd.; General Electric Co., Ltd.
3½-ton electric tipping wagon.—D.P. Battery Co., Ltd.
Tamping machine for cable trench filling (£330).—B. Johnson & Son.

Annual contracts. Accepted:—
Crucibles.—Morgan Crucible Co., Ltd.
Earthenware pipes.—Doulton & Co., Ltd.; Albion Clay Co., Ltd.
Insulators.—Doulton & Co., Ltd.; Bullers, Ltd.; Gaskell & Grocott (6 months' contract only); J. Macintyre & Co., Ltd.; Electric and Ordnance Accessories Co., Ltd.
Iron castings.—J. Emmott & Co.; Richmond & Chandler; J. Stubbs, Ltd.
Service boxes.—Forrest & Sym; J. Needham & Sons, Ltd.; J. Stubbs, Ltd.; Sykes & Dyson, Ltd.
Auto transformers and balancers.—General Electric Co., Ltd.
Trifurcating boxes.—British Insulated & Helsby Cables, Ltd.; Forrest and Sym; Johnson & Phillips; Siemens Bros. & Co., Ltd.; Sykes and Dyson, Ltd.
Dry batteries.—Ever-Ready Co. (Great Britain), Ltd.
Time switches.—Venner Time Switches, Ltd.
Power switches.—Horstmann Gear Co., Ltd.; Venner Time Switches, Ltd.
Potential and current transformers.—Ferranti, Ltd.
Switches and fuses for hired cookers (6 months' contract only).—J. H. Tucker & Co., Ltd., for ironclad switchgear and fuses; and Tok Switches, Ltd., for double-pole indicating rotary switches.
Electric cooking ranges (6 months' contract only).—Jackson Electric Stove Co., Ltd.; Cable Accessories Co., Ltd.; General Electric Co., Ltd.
Electric kettles (6 months' contract only).—Metropolitan-Vickers Electrical Co., Ltd.; Edison Swan Electric Co., Ltd.; Dowsing Radiant Heat Co., Ltd.
Meters, d.c. mercury motor, Ah-type, up to 100 amps.—Ferranti, Ltd.; Chamberlain & Hookham, Ltd.
D.c. watt-hour, 200 to 1,000 Ah.—Aron Electricity Meter, Ltd.
Single-phase, a.c. meters—Measurement, Ltd.; Landis & Gyr, Ltd.; Metropolitan-Vickers Electrical Co., Ltd.; Ferranti, Ltd.
A.c., 5-Ah., for use in conjunction with current transformers, &c.—Metropolitan-Vickers Electrical Co., Ltd.; Landis & Gyr, Ltd.

Notes.

The Inquiry into the Sydney Electrical Contracts.—It is reported from Sydney that a Special Committee of Aldermen appointed by the Sydney City Council to investigate the statements regarding methods adopted by electrical firms in arranging that prices tendered should include an amount for unsuccessful tenderers, met in June last. Mr. J. B. Suttor expressed his willingness to give evidence, and he did so, making certain allegations. The firms affected were officially invited to attend by the Town Clerk, but, according to the *Sydney Morning Herald*, they were not present on June 5th. At the adjourned inquiry on June 12th, Mr. Suttor was subjected to cross-examination with regard to his statements by counsel appearing for the Australian General Electric Co., Ltd. Mr. Suttor said that the information upon which he relied had been supplied to him by Mr. A. W. Kendall, who at that time was managing director in Australia for the Australian General Electric Co., Ltd. Mr. Kendall had been invited to attend the inquiry, but he had replied that for some years he had not been identified with the Australian General Electric Co., and was not concerned in the present allegations. Mr. Kendall had been asked by the committee to attend in his private capacity, but he did not reply, nor was he present. Mr. Suttor said he was reserving "for a higher tribunal" a record which was not the property of the company, but was given to him personally for his information, and he kept it "at home under lock and key." Mr. Suttor was informed that it was unfair to make charges which involved the Council and its officers without providing the utmost facilities for investigating the matter to the fullest possible extent. To this Mr. Suttor is reported to have replied that the document had reference to other matters of vital public importance outside the Council. "He was prepared to produce the document, 'which was in the handwriting of Mr. Kendall,' when it was asked for by a 'higher tribunal.'" An alderman said that they were only wasting time if evidence was to be held back for a Royal Commission. Mr. Suttor said he would produce all the documents to a Royal Commission. Mr. Boyce, K.C., who appeared in order to assist the Lord Mayor and aldermen in conducting the inquiry, remarked: "But you have been a party to these transactions during the period you say you were manager—between 1908 and 1918?" To this Mr. Suttor replied: "I have always fought the practice and protested against it, and I can bring evidence to prove this." Mr. A. A. Read, who appeared for Mr. Suttor, said: "The position that Mr. Suttor takes up is that this was a 'combination' that affected all the States of Australia, and that it extended to London and New York, as the moneys were principally paid in one or other centre, and that, therefore, the 'combination' is an offence under the provisions of the Australian Industries Preservation Act, and that action should be taken under that Act." The inquiry was further adjourned.

Social Events.—The staff of the Southport electricity works has recently held its annual outings, the venue being Lancaster. As only one half of the staff could be away at one time, there were two separate excursions. The journey was made by motor coach. At Lancaster several bowling matches, which had been previously arranged, were played off. On the afternoon of Saturday, July 12th, Mr. Councillor R. Roberts, chairman of the Lancaster Corporation Electricity Committee, entertained half the staff of the Electricity Department, with their wives, at a garden party at his house, Netherdene, Haverbreaks, Lancaster. The other half were similarly received on the following Saturday afternoon. An enjoyable afternoon was spent, with tea and games on the lawns.

Fatality.—An inquest was held last week into the death of George Watson, which occurred at the Newbiggin Colliery, Northumberland. It was stated that while at work in the mine the deceased man placed both of his hands on a steel girder and collapsed. He was lifted from the girder at once, but died immediately. Mr. W. Francis, the colliery electrician, said that when he tested the girder he received a slight shock, and found a breakage in the insulation of a cable. The shock so received was too slight to be dangerous.—Dr. W. Stephenson said that he found deceased to be in a lymphatic state, in which a slight accident would more readily precipitate death than if he were in a normal state of health.—The verdict was that death was due to electric shock, which proved fatal because of deceased's physical condition.

The Institute of Metals.—The autumn meeting of the Institute is to be held in London from September 8th to 11th. On the first day the third annual autumn lecture will be delivered by Mr. W. M. Corse, S.B., of the National Research Council, D.C., U.S.A., on "Recent Developments in Non-ferrous Metallurgy in the United States, with Special Reference to Nickel and Aluminium-bronze." On September 9th the general meeting will be held at the Institution of Mechanical Engineers, and a selection of papers will be presented and discussed. Following luncheon at the Connaught Room, members and their ladies will visit the British Empire Exhibition. On September 10th the general meeting will be concluded, more papers will be discussed, and visits paid to various works and the National Physical Laboratory. On the last day there will be a river trip to Windsor and Eton.

A Conference on Illuminating Engineering.—We understand that a conference on Illuminating Engineering has been arranged to take place at the British Empire Exhibition on the afternoon of Tuesday, August 12th. Amongst other items a report on the proceedings at the First International Conference on Industrial Hygiene and the meeting of the International Illumination Commission held in Geneva will be presented, and special attention will be devoted to progress in the lighting of schools and factories. It is also anticipated that the subject of "Exhibition Lighting" will be discussed and Mr. Haydn T. Harrison had consented to give an address on this subject, but unfortunately he has been compelled by ill-health to cancel all engagements for some months to come. We note that, in connection with public lighting, a paper entitled "The Illumination of Highways from the Motorist's Point of View," is to be presented by Mr. Edward Fryer, head of the Road Department, Automobile Association.

Further particulars and tickets for the conference, which will be open to all interested in the subject of illumination, are obtainable from the Hon. Secretary of the Illuminating Engineering Society (Mr. L. Gaster, 32, Victoria Street, London, S.W.1).

The Brooks Sayers Dynamo.—We understand that Mr. W. Brooks Sayers, pursuing the development of his "inductor cylinder machine" in which the free armature core remains stationary whilst the winding rotates, now has two six-pole machines with a nominal rating of 25 kW each, in running order, and is about to put them through efficiency tests, &c. The principles of this machine were described in our issue of September 8th, 1922.

Appointments Vacant.—Attendant for 3,000-kVA static sub-station (D.J.I.C. scale) for Wimbledon electricity works; charge engineer for Doncaster Electricity Dept. (See our advertisement pages to-day.)

London Electricity Charges.—On Monday and Tuesday last an inquiry into the application of the London Chamber of Commerce and the City Corporation for a revision of the maximum price which the Charing Cross Electricity Supply Co., Ltd., is permitted to charge, was held by Sir Harry Haward and Mr. H. Booth, Electricity Commissioners. The applicants asked for the reduction of this maximum from 8d. to 5d. per kWh, and their case was presented by Mr. Craig Henderson, K.C., and Mr. E. H. Tindall Atkinson, for the Corporation, and Mr. Jacques Abady and Mr. E. F. Maxwell for the Chamber of Commerce. Mr. James Whitehead, K.C., and Mr. Carrol Romer appeared for the company. After hearing evidence the Commissioners stated that they would report to the Minister of Transport, who would promulgate his decision in due course.

The Committee on Export Trade.—It was announced in Parliament on Tuesday that the Board of Trade had set up the following committee to report on export trade:—Sir Arthur Balfour (Chairman), Mr. John Baker, Sir W. H. Beveridge, Mr. Henry Boothman, Mr. W. T. Charter, Mr. C. T. Cramp, Mr. Hugh Dalton, Sir Harry Goschen, Mrs. M. A. Hamilton, Mr. F. A. Hargreaves, Sir Norman Hill, Bart., Sir John S. Hindley, Mr. David Landale, Sir W. Clare Lees, Mr. P. J. Pybus, Mr. Arthur Shaw, Sir Allan Smith, Sir Hubert Llewellyn Smith. The reply from one further proposed member is still outstanding owing to his absence abroad. The secretary is Mr. Walter Carter, Board of Trade, Great George Street, S.W.1. Mr. A. R. Fraser (of the Department of Overseas Trade) and Mr. W. L. Buxton (of the Ministry of Labour) have been appointed assistant secretaries. The terms of reference are "to inquire into and report upon the conditions and prospects of British industry and commerce, with special reference to the export trade, and to make recommendations in regard thereto."

A.M.I.E.E. Examination.—The next examination will be held on October 30th and 31st and November 1st. Candidates must be either Students or Graduates of the Institution or have lodged with the Secretary a duly completed form "E" for election as Associate Member. Entry forms for the examination, which must be completed and returned by September 1st, and particulars regarding election to membership of the Institution, may be had on application to the Secretary, The Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C.2.

The London Electricity Bills.—In its Political Notes on Wednesday *The Times* said that as the Government's scheme of electrification would require legislation, it was not likely that much could be done during the coming winter. The writer says:—"It is satisfactory to know that there is now some prospect that progress will be made with the London Electricity Bills, which have been held up by certain of the Labour members, despite the fact that the companies are ready to place orders for large quantities of electrical plant directly the Bills are passed. Negotiations have been taking place between the Electricity Commissioners and the companies to see whether the latter would be willing to give the electrical authority power to purchase the undertakings at an earlier date than 1971, the time mentioned in the Bill. The companies have now agreed that, if satisfactory terms of compensation can be arranged, the authority shall have the power to purchase the concerns at any decennial period between 1931 and 1971."

London Labour's Electricity Supply Policy.—We are officially informed that the attached resolution has been forwarded by the London Labour Party for consideration by the Annual Conference of the National Labour Party, which is to be held in October :—

ELECTRICITY SUPPLY.

(1) That in the opinion of the Labour Party it is of vital importance, in the interests of British industry and agriculture and British housewives, that general legislation on electricity should be introduced by the Government; and that in the meantime private legislation, calculated to strengthen the grip of private monopoly in this important and growing industry, should be rejected.

(2) That the Government be urged to adopt one of the two following alternative lines of policy :—

(a) The partial or complete nationalisation of the generating side of the industry, coupled with municipal distribution; or

(b) Legislation strengthening, from the point of view of public ownership and control, the existing electricity statutes, and incorporating the following points :—

(i) The compulsory appointment on definite lines of a joint electricity authority for delimited areas, with a preponderance of public representatives;

(ii) A statutory obligation to be imposed on a joint electricity authority to carry out an approved technical development of electrical supply;

(iii) The immediate compulsory acquisition by the joint electricity authority of all electricity undertakings, municipal or company, at cost, less depreciation, the same principle of compensation being applied to all classes of undertakings, including power companies;

(iv) Instruction to the joint electricity authority, wherever practicable consistent with efficiency, to arrange with a local authority for the latter to act for the joint electricity authority in its own area in the matters of distribution;

(v) The raising of necessary capital (wherever considered advantageous) by State methods to meet capital expenditure by each joint electricity authority.

Works Accountants.—The annual dinner of the Institute of Cost and Works Accountants was held in London last week, and on Friday Viscount Leverhulme opened the third annual conference at the Connaught Rooms. Papers and discussions were contributed which brought out the importance of accurate costing figures in connection with manufacturing and trade. Selling and distribution costs, it was considered, would assume greater importance, especially bearing in mind the need for this country to develop more and more her export trade and retain her position in world trade.

American Electric Vehicle Development.—The American Society for Electrical Development is organising a fund of $12,500 with the object of promoting a further development campaign in favour of the use of electric motor vehicles. Towards the amount desired a sum of $10,550 has already been subscribed by ten concerns connected with the manufacture of electric vehicles and accumulators.

Our Personal Column.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the* ELECTRICAL REVIEW *posted as to their movements.

The Postmaster-General has appointed Mr. H. WILSON, M.I.E.E., to be superintending engineer of the South Wales district, with headquarters at Cardiff. Mr. Wilson has been attached to the Designs Section of the Engineer-in-Chief's office for the past 15 years, and is well-known to electrical contractors on the Department's list, having been closely associated with the supply of material for both telegraph and telephone purposes during that period. Mr. Wilson has been on the staff of the Battersea Polytechnic as lecturer on telegraphy and telephony since 1904.

Hastingden Town Council has increased the salary of Mr. BARNES KAY, tramway manager, from £400 to £450.

The honour of Commander of the Order of Leopold has recently been conferred upon Dr. LEO HENDRICK BAEKELAND, president of the Bakelite Corporation, New York, and president of the American Chemical Society, in recognition of his service to science and commerce. Dr. Baekeland, although he has spent many years in America, is a Belgian, being a native of Ghent.

Morecambe Corporation Electric Lighting Committee recommends the increase of the salary of the borough electrical engineer to £500 per annum.

Sir ERNEST RUTHERFORD, the president of the British Association, and Major-General Sir DAVID BRUCE, the president-elect, who is to deliver the presidential address at Toronto on August 6th, were among the party of scientists who sailed from Liverpool on Saturday last on the *Caronia*.

Captain C. G. HUNTLEY, A.M.I.E.E., 26th London Electrical Engineers, has been transferred to the Reserve of Officers of the Royal Engineers (T.A.).

Mr. PERCY L. CAMPLING, engineer and joint manager of the Yarmouth Corporation Electric Tramways, has been appointed chief engineer of the Corporation electricity works, and is to hold the two appointments jointly.

Last week Mr. H. E. BLAIN, late assistant managing director of the Underground Railways Co., was presented with his portrait in oils by his former colleagues and staff. Lord Ashfield made the presentation.

Dr. LESLIE AITCHISON, D.Met., B.Sc., F.I.C., consulting metallurgist, of Birmingham, has given up his practice to take up a position as assistant to Mr. Horace W. Clarke, the managing director of James Booth & Co. (1915), Ltd., of Birmingham. Messrs. Booth are in the Vickers group of companies, and are the sole manufacturers of the light alloy, "Vickers' Duralumin." Dr. Aitchison will act as superintendent of the company.

The Siemens and English Electric Lamp Co., Ltd., has appointed Mr. R. D. PAGE (late of the Southampton branch) as branch manager at Newcastle-on-Tyne. His connection with Messrs. Siemens extends back some 16 years.

Mr. W. G. WALTER, A.M.I.E.E., who has been chief of the Electrical Department of Sir Wm. Arrol & Co., Glasgow, for between twelve and thirteen years, is resigning that position, and is commencing business on his own account at Southey House, Westgate Buildings, Bath, where he desires to receive catalogues of power, lighting, and radio equipment.

Senatore G. MARCONI, G.C.V.O., has been elected chairman of the Council of the Royal Society of Arts for the year 1924-5.

Mr. T. S. WALLIS, A.M.I.E.E., did not accept the appointment offered him by the Hammersmith Electricity Committee (ELEC. REV., July 25th, p. 151), as in order to retain his services the Wimbledon Council increased his basic salary from £433 to £524, the figure offered at Hammersmith.

Commander HAYDN T. HARRISON's many friends will learn with regret that under medical advice he has been compelled to take a complete rest for three months, during which he will not be permitted to write letters; they will join with us in wishing him a speedy restoration to health.

Obituary.—MR. W. CAMPBELL.—The death is announced from Schenectady, New York, U.S.A., of Mr. Wilfred Campbell, at the early age of 40 years. The deceased, who was an Englishman (a native of Manchester), had since 1908 been associated with the General Electric Co., U.S.A., and had done valuable research work in connection with turbines, and particularly the protection of steam turbine disk wheels from axial vibration. Mr. Campbell's death followed upon an operation for appendicitis.

New Companies Registered.

Faulkner & Co. (Manchester), Ltd. (199,364).—Private company. Registered July 18th. Capital, £2,000 in £1 shares. To acquire the business carried on at 16, Vesta Street, off Mill Street, Manchester, by Grace F. Woods and R. S. Woods as Faulkner & Co., and to carry on the business of electrical and mechanical engineers, manufacturers of, and dealers in wireless sets, &c. The permanent directors are :—Mrs. G. F. Woods, 372, Dickenson Road, Longsight, Manchester; R. S. Woods, 372, Dickenson Road, Longsight, Manchester, electrical engineer. Qualification, £100. Solicitors : Lancashire, Humphreys & Grundy, 2, John Dalton Street, Manchester. Registered office : 2, John Dalton Street, Manchester.

U.S. Radio Co., Ltd. (199,360).—Private company. Registered July 18th. Capital, £500 in £1 shares. To acquire the business carried on at 155, High Street, Lewisham, as the "U.S. Radio Co.," to adopt an agreement with A. F. Urech, A. J. Carter, E. W. Lee, and C. H. Williams, and to carry on the business of wireless, radio, electrical, automobile, mechanical, and mining engineers, electricians, suppliers of electricity, &c. The permanent directors are :—J. S. Michaelson, 116, Priory Road, N.W.6, company director (chairman and managing director); Mrs. M. P. Michaelson, 116, Priory Road, N.W.6. Remuneration as fixed by the board. Solicitors : Woolfe & Woolfe, 13a, Old Burlington Street, W.1. Registered office : 155, High Street, Lewisham, S.E.

Eagle Electrical Manufacturing Co., Ltd. (199,397).—Private company. Registered July 19th. Capital, £1,500 in £1 shares (500 6 per cent. cumulative preference and 1,000 ordinary). To adopt an agreement with J. B. Bignamy and to carry on the business of manufacturers and repairers of, and dealers in wireless instruments, appliances and accessories, engineers, formerly carried on by the vendor at 1 and 2, Newman's Passage, Newman Street, W.1, as the "Eagle Electrical Manufacturing Co." The first directors are :—E. H. Henry, "St. Ippollitts," Hitchin, gent.; J. B. Bignamy, 1 and 2, Newman's Passage, Newman Street, W.1, electrical engineer. Qualification, £50.

Mordey Mineral Separation Co., Ltd. (199,359).—Private company. Registered July 18th. Capital, £10,000 in £1 shares. To adopt an agreement with W. M. Mordey and to work and develop the inventions of the vendor relating to electro-magnetic separation or concentration of minerals, &c. The first directors are :—W. M. Mordey, 22a, Gloucester Terrace, W.2, consulting engineer; D. F. Campbell, St. Mary's House, Weybridge, engineer. Qualification, £100. Solicitors : Faithfull, Owen, Blair and Wright, Dacre House, Victoria Street, S.W. Registered office : 17, Victoria Street, Westminster, S.W.

British Radio Valve Service, Ltd. (199,303).—Private company. Registered July 16th. Capital, £2,000 in £1 shares. To promote the sale of British radio valves and to carry on the business of manufacturers of, and dealers in all kinds of wireless, radio and electrical apparatus, &c. The first directors are :—Capt. G. R. S. Willans (chairman), 6, High Park Road, Kew Gardens, Surrey; Major T. H. Grange (managing director), "The Sheiling," Oval Way, Gerrard's Cross, Bucks.; Capt. G. N. Travers, "Undercliffe," Leigh-on-Sea. Qualification, 1 share. Remuneration as fixed by the company. Solicitors : Yarde & Loader, 1, Raymond Buildings, Gray's Inn, W.C. Registered office : Hazlitt House, Southampton Buildings, Holborn, W.C.

Barrett & Morris, Ltd. (199,384).—Private company. Registered July 18th. Capital, £100 in £1 shares. To carry on the business of sellers, installers, and suppliers of apparatus for wireless telephony and telegraphy, &c. The permanent directors are:—B. Morris, 19, Gloucester Road, Finsbury Park, N.4, dealer; G. Barrett, 12-16, Stepney High Street, E.1, postmaster.

Audion Radio Co., Ltd. (12,254).—Private company. Registered in Edinburgh July 12th. Capital, £1,000 in £1 shares. To carry on the business of manufacturers of wireless apparatus and plant of all kinds, &c. The first directors are:—H. G. Russell, "Arcadia," Ardgowan Square, Greenock, engineer; M. J. Dougall, "Rosebank," Waterloo Road, Ayr, director of companies. Qualification, 25 shares. Secretary: G. Baxter. Registered office: 85, Pitt Street, Glasgow.

Everett (Southampton), Ltd. (199,398).—Private company. Registered July 19th. Capital, £50 in 1s. shares. To carry on the business of electrical dealers, factors and agents, manufacturers of, agents for, and dealers in electrical fittings, accessories and appliances, including things for use in connection with radio or wireless telegraphy and telephony, manufacturers of, and dealers in all apparatus for use in sports or games, &c. The first directors are:—L. M. Everett, 83, Charlton Road, Southampton; W. H. Berriedale Johnson, 34, St. James' Road, Southampton. Registered office: 110, High Street, Southampton.

Gush's Electro-Rectification System (1924), Ltd. (199,443).—Private company. Registered July 22nd. Capital, £50,000 in 38,000 8 per cent. cumulative preference and 12,000 ordinary shares of £1 each. To acquire the business and undertaking of Gush's Electrolytic System, Ltd., to adopt agreements (1) with Gush's Electrolytic System, Ltd., and (2) with Gush's Water Rectifiers, Ltd.; to acquire and turn to account patents, to acquire, equip, maintain and manage laboratories for the purpose of research, experimental and development work, and to carry on the business of electrical, chemical, mechanical, consulting and general engineers, electrical, chemical, surgical, and scientific apparatus and instrument makers, tool makers, brassfounders, metal workers, &c. The subscribers (each with one preference share) are:—A. E. Fournier, Effingham House, Arundel Street, Strand, W.C.2, solicitor's managing clerk; D. V. Turner, Effingham House, Arundel Street, Strand, W.C.2, private secretary. The first directors are:—Engineer-Comdr. A. S. Gush and S. J. Croucher. Qualification, 100 shares. Remuneration, £100 each per annum (chairman £150). Solicitors: Amery, Parkes & Co., Effingham House, Arundel Street, Strand, W.C.2.

A. C. Thompson & Co., Ltd. (199,362).—Private company. Registered July 18th. Capital, £1,000 in £1 shares. To carry on the business of steam gauge makers, mechanical and electrical engineers, manufacturers of all kinds of gauges, and mechanical and electrical tools and instruments, founders, &c. The first directors are:—G. H. Ingram, 175, College Road, Mossley, Birmingham, gent.; A. C. Thompson, 19, Second Avenue, Selly Park, Birmingham, gauge manufacturer; W. J. Bowers, 131, Upper Sutton Street, Aston, Birmingham, tool maker. Qualification, 50 shares. Solicitor: K. Povey-Harper, Old Square Chambers, 136, Corporation Street, Birmingham.

General Engineering Development Trust, Ltd. (199,458).—Private company. Registered July 23rd. Capital, £7,500 in 6,000 preferred ordinary shares of £1 and 30,000 deferred ordinary shares of 1s. The preferred ordinary shares confer on the holders thereof rateably the right to 40 per cent. of the profits each year available for dividend, and the deferred ordinary shares confer on the holders thereof rateably the right to 60 per cent. of such profits. In the event of a winding up, the deferred ordinary shares rank *pari passu* with the preferred ordinary shares as to capital, and shall be entitled to 60 per cent. of any surplus assets. To acquire from P. H. Waller the benefit of certain existing inventions in relation to electrically imparting information to the public. The directors are:—P. H. Waller, 24, Kingsfield Road, Oxhey, Herts., engineer; S. Emms, 202, Richmond Road, Kingston-on-Thames, advertising consultant, &c. (chairman, Boats and Cars, Ltd.); F. J. Palmar, 8, Charlton Park Terrace, S.E.7, merchant; and others to be appointed by the subscribers. Remuneration, £100 each per annum (chairman £150). Solicitors: Russell and Arnholz, 3 and 4, Great Winchester Street, E.C.2. Registered office: Astor House, Aldwych, W.C.2.

E. S. White & Co., Ltd. (199,467).—Private company. Registered July 23rd. Capital, £2,000 in £1 shares. To acquire the business of electrical engineers now carried on by F. Stringer and E. S. White at Friar's Gate, Warrington, as "E. S. White & Co." The directors are:—F. Stringer (permanent), 709, Knutsford Road, Warrington; E. S. White, 91, Manchester Road, Warrington; F. Stringer, Junr., 709, Knutsford Road, Warrington. Qualification, 100 shares. Remuneration, £3 each per annum (chairman £5). Solicitor: T. S. Steel, Mill Street Chambers, Warrington. Registered office: Friar's Gate, Warrington.

Official Returns of Electrical Companies.

British Mica Co., Ltd. (72,187).—Return dated May 8th, 1924. Capital, £5,000 in 2,000 preference and 3,000 ordinary shares of £1 each. 785 preference and 194 ordinary shares taken up. £979 paid on 785 preference and 194 ordinary shares. £2,000 considered as paid on the remainder. Mortgages and charges, £2,300 debentures and £650 mortgage.

H. J. Cash & Co., Ltd. (79,701).—Return dated March 11th, 1924. Capital, £25,000 in £1 shares. 15,000 shares taken up. £10,000 paid. £5,000 considered as paid. Mortgages and charges, nil.

Scott & Scott (Bournemouth), Ltd.—Equitable mortgage on 91, Poole Road, and freehold and leasehold premises in rear thereof, Westbourne, Bournemouth, dated July 14th, 1924, to secure all moneys due or to become due from the company to Lloyd's Bank, Ltd., not exceeding £4,000.

Houghton's Electrical Engineering Co., Ltd.—Debenture dated July 3rd, 1924, to secure £400 charged on the company's undertaking and property, present and future. Holder: C. F. Dobson, 17, Blakesley Avenue, Ealing, Middlesex.

Pickvance, Ltd.—Particulars filed of £1,200 debentures authorised May 9th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £250.

Christy Brothers & Co., Ltd.—Mortgage dated June 24th, 1924, to secure £1,000 charged on certain land and buildings in Coronation Road, Bedminster, Bristol. Holders: Misses A. E., A. R., and H. L. Cathcart, 30, Archfield Road, Cotham, Bristol.

Watford Radio Supplies, Ltd.—Debenture dated June 19th, 1924, to secure £150 charged on the company's undertaking and property, including uncalled capital. Holder: H. T. Herbert, 95, High Street, Watford.

London Magneto Repairing and Winding Co., Ltd.—Second debenture dated June 26th, and third debenture dated June 27th, 1924, to secure £500 and £1,000 respectively, charged on the company's property, present and future, including uncalled capital. Holders: C. E. P. Taylor, 24, Craven Park, Harlesden; and Mrs. C. R. M. Clark, 68, Radnor Road, Harrow-on-the-Hill.

Dudley, Stourbridge and District Electric Traction Co., Ltd.—Acknowledgment of indebtedness dated February 2nd, 1905 (supplemental to trust deeds dated May 20th, 1902, and September 15th, 1904), to secure £30,000 additional debenture stock, charged on the company's assets, present and future. Trustees: Electric and General Investment Co., Ltd., 1 and 2, Great Winchester Street, E.C. (Registered July 14th, 1924, pursuant to Order of Court.)

Satisfaction to the extent of £27,500 on May 21st, 1924, of debenture stock covered by trust deed dated May 26th, 1902, and acknowledgments of further indebtedness, dated September 15th, 1904, and February 2nd, 1905, securing £60,000, £10,000, and £30,000 respectively.

Couzens & Akers, Ltd.—Charge on 105 Aston Road, Birmingham, dated July 11th, 1924, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Pressland Electric Supplies, Ltd.—Particulars filed of £6,000 debentures authorised June 30th, 1924, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £3,500.

Cleveland and Durham Electric Power, Ltd.—Satisfaction to the extent of £9,900 on various dates from April 11th, 1923, to March 8th, 1924, of debentures secured by trust deed dated October 6th, 1913, and supplemental to trust deed dated December 31st, 1918, securing £250,000.

Electrolux, Ltd.—Satisfaction in full on July 7th, 1924, of debenture dated November 23rd, 1923, securing all moneys due or to become due.

Tees Power Station Co., Ltd.—Satisfaction to the extent of £20,000 on various dates between March 5th and July 9th, 1924, of debentures secured by trust deed dated May 7th, 1918, securing £600,000.

F. Patrick, Ltd.—J. W. Hirst, of North British and Mercantile Buildings, East Parade, Leeds, was appointed receiver and manager on July 15th, 1924, under powers contained in debentures created June 14th, 1921.

Kent House Engineering Co., Ltd.—E. W. Viney, of 11, Queen Victoria Street, E.C.4, was appointed receiver and manager on July 1st, 1924, under powers contained in mortgage debentures dated March 31st and April 29th, 1922, and June 6th, 1924.

Technical Instrument Case Manufacturing Co., Ltd.—W. B. Pearson, of 5, John Street, Bedford Row, W.C., was appointed receiver and manager on July 8th, 1924, under powers contained in debenture dated September 4th, 1923.

Stanley J. Watson Magneto Co., Ltd.—P. T. C. Wigglesworth, of 475, Fulham Palace Road, Fulham, S.W., was appointed receiver on July 10th, 1924, under powers contained in debenture dated October 31st, 1921.

Tingey Wireless, Ltd.—F. W. Lord, of 37, Walbrook, E.C., was appointed manager on July 14th, 1924, under powers contained in debenture dated June 1st, 1923.

Pressland Electric Supplies, Ltd.—Issue on July 2nd, 1924, of £1,000 debentures, part of a series already registered.

Runbaken Magneto Co., Ltd.—J. Collier, of 4, Chapel Walks, Manchester, was appointed receiver on July 17th, 1924, under powers contained in debentures dated June 4th, 1919, November 10th, 1920, and March 26th, 1923.

City Notes.

Mexican Light and Power Co., Ltd.

The gross earnings during 1923 amounted to $14,827,943 (Mexican), as compared with $13,193,435 in the preceding year. After allowing for depreciation, the net income was $8,309,162 ($6,467,988), but this included charges against the municipal and Government authorities for public lighting and other services amounting to $1,500,000, which had not been collected at the end of the year. The total amount now outstanding in this connection is now $4,221,277. The directors state that there is no surplus revenue available for the payment of the accrued interest on the 6 per cent. cumulative income bonds, the balance remaining after the payment of fixed charges having been contributed towards meeting the company's expenditure since 1921. Although the disturbances in connection with the attempt to overthrow the Obregon Government have now subsided, the Mexican Government has been left in an unsatisfactory financial condition. The meeting of the company is to be held in Toronto on August 14th.

Mexico Tramways Co.

The report for 1923 shows gross earnings of $12,266,829 (Mexican), a decrease of 5.22 per cent. from the 1922 figure. The net earnings decreased to a greater extent, being $1,146,048, as against $2,097,917. The decrease is due to large expenditure on repairs and maintenance. The federal and municipal authorities have taken no steps to satisfy the company's claim for compensation for damages sustained during the recent disturbances. There is no surplus revenue available to meet the accrued interest on the 6 per cent. mortgage bonds. The report expresses the hope that conditions will become more settled after the presidential election. The meeting will be held in Toronto on August 14th.

Brazilian Traction, Light and Power Co., Ltd.

The total income of this company during 1923 was $7,510,459, and the net revenue, after meeting general expenses and providing for general amortisation, was $6,929,965. This is distributed as follows: Four quarterly dividends of 1½ per cent. each on preference shares, $600,000; and four dividends of 1 per cent. on ordinary shares, $4,262,477, leaving a surplus of $2,067,488. To this is added $6,840,270 brought forward, making $8,907,758, of which $3,000,000 is transferred to reserve, the balance ($5,907,758) being carried forward. Although the net earnings of the company in Brazilian currency

were higher than in the previous year, the decline of the exchange gave a dollar result 5.93 per cent. lower. The question of higher telephone rates in the City of Sao Paulo and other centres in that State is still under consideration, and a favourable result is expected.

Petters, Ltd. Mr. E. W. Petter, presiding at the annual meeting held at Yeovil, said that the sales for the past year showed a very satisfactory increase in all departments. After paying the arrears of preference dividend for the half-year ended March, 1921, there would be three years of arrears to pay. Unless some very great change came over the fortune of the business it was difficult to see how these arrears could be liquidated in cash, and the directors had under consideration proposals for funding the arrears of preference dividend—that is, they would probably have to ask the preference shareholders to accept shares in the company in payment of the arrears of dividend due to them.

Argentine Light and Power Co., Ltd. The annual meeting was held on July 25th under the chairmanship of Sir George A. Touche, Bart. In moving the adoption of the report and accounts, which were dealt with in our issue of July 25th (p. 152), the Chairman said that the continued depression of the Argentine peso had led to many disappointments among investors. Nevertheless, the Government was taking steps to improve this state of affairs, and the financial position of the Republic was undoubtedly sound. No country in the world had a greater interest in the prosperity of Argentina than this country; it had been calculated that £400,000,000 of British capital was invested there. Unfortunately a substantial part of it, including part of the company's capital, was receiving no return or smaller returns than before the war. The need for capital was growing, and any measure which tended to improve the currency would greatly assist the country. Referring to the company's interests in the city of Cordoba, the Chairman said that an agreement for the electrification of part of the remaining horse tramway and the suppression of the remainder had been arrived at with the authorities. The municipality had got into arrears seriously with the payment of sums due to the electricity supply company; there was, however, no suggestion of repudiation, and the payment of interest on the debt had been agreed to. The latter company had suffered considerably owing to the reduction and occasional cutting-off of the water supply from the San Roque dam during the improvements which were being made there. The operation of the steam plant had added a great deal to the expenses. A new 2,000-kW set and auxiliaries had been added to the steam plant in December last; this would enable the company to deal efficiently and economically with any load which might be thrown upon the system. The energy sold had increased during the year from 21,203,008 to 22,686,533 kWh. The tramways had carried 19,142,800 passengers, as against 17,499,649 in 1922, and the car-kilometres run had increased from 3,937,532 to 4,288,673. The results of the first year of operation had fully justified the acquisition of the Argentine Tramways and Power Company's undertakings in Santa Fé. The combined accounts of the Cordoba and Santa Fé undertakings made a good showing, and paved the way, he hoped, for the payment of dividends on the ordinary shares. The report and accounts were adopted.

German Companies. The *Duisburg Cable Works Company* reports that a loss was incurred as a result of last year's working.

The *Accumulator Works Company*, of Berlin and Hagen, proposes to carry forward the paper mark profits earned in 1923.

The *Fried. Merk Telephone Construction Co.*, of Munich, in carrying forward the surplus for 1923, notifies the conversion of the capital from a paper to a gold mark basis.

The electrotechnical factory of *Pieper and Co.*, of Reisholz, which has carried forward the paper mark profits earned in 1923, reports that the conditions of business at present are satisfactory.

Companies to be Struck Off the Register.—The names of the following companies will be struck off the register at the expiration of three months, unless cause is shown to the contrary:—

Aberdare Electrical Co., Ltd.
Allen Electric Lamp Repairing Co., Ltd.
Anglo-Russian Engineering Co., Ltd.
Blackpool, St. Annes, and Lytham Tramways Co., Ltd.
British Association of Trade and Technical Journals, Ltd.
Cross Electric Supply Co., Ltd.
Dynamotor, Ltd.
Electrodes, Ltd.
Electro Magnets Motors, Ltd.
Filter Electric Heater, Ltd.
Gyrostatic Turbines, Ltd.
International M.P. Superheater Co., Ltd.
Leonard W. Holmes & Partners, Ltd.
Lord-Howe Electrical Engineering Co., Ltd.
Preston Portable Battery & Lamp Co., Ltd.
Yorkshire Incandescent Electric Lamp Co., Ltd.

Stewarts & Lloyds, Ltd.—The directors have decided to recommend that the share capital be increased by the creation of 2,500,000 additional deferred shares of £1 each in view of the large expenditure incurred on additions to the plant and works. The shares will be offered to existing holders at par—one share for every two held.

Indo-European Telegraph Co., Ltd.—The accounts for 1923 show a total revenue of £197,515 and expenses amounting to £155,651. To the balance (£41,864) is added £22,250 brought forward, making £64,099. From this are deducted corporation profits tax and income tax, £1,494, and interim dividend, £10,625. The balance of £51,979 is dealt with as follows:—Final dividend (£1 2s. 6d. per share, free of tax, making 7 per cent. free of tax, for the year), £19,125; reserve fund, £10,000; carried forward, £22,854.

Northampton Electric Light and Power Co., Ltd.—The directors have declared the following interim dividends:—2½ per cent. on the 5 per cent. preference "B" shares, and 4 per cent. on the ordinary "B" shares.

Stock Exchange Notices.—The undermentioned securities have been ordered to be officially quoted:—

American Telephone and Telegraph Co.—$8,154,400 capital stock.
Vickers.—Scrip, fully paid, for £2,000,000 5½ per cent. first mortgage debenture stock.
Andhra Valley Power Supply Co.—£1,000,000 seven and a-half per cent. 10-year secured sterling notes, Nos. A1 to 3,517 and A3,519 to 3,526 (£100), 61 to 393 (£500), and C1 to 451 (£1,000), registered.

Kalgoorlie Electric Tramways, Ltd.—The gross receipts during 1923 were £28,918, and the net profits, before providing for depreciation, were £7,445. The ratio of expenses to receipts increased from 67.21 to 68.21 per cent. The amount of "A" debenture stock outstanding at the end of the year was £36,780, £3,125 having been redeemed during the year. The business was affected by the closing of the mines due to a strike. The mines are still working under restricted conditions. The meeting was to be held on Wednesday last.

Tottenham District Light, Heat and Power Co.—The following dividends have been declared for the half-year ended June 30th last:—At 5 per cent. per annum on the preference stock; at 8 per cent. per annum on the "A" stock; and at 6¼ per cent. per annum on the "B" stock.

Kensington and Knightsbridge Electric Lighting Co., Ltd.—The directors have declared an interim dividend on account of the year ending December 31st next of 5s. per share on the ordinary shares, payable on August 14th.

Metropolitan Railway Co.—A dividend of 2 per cent. actual has been declared on the ordinary stock, as against 1½ per cent. in 1922. The Surplus Lands Committee has declared a dividend of 1½ per cent. actual, as in the previous year.

French Company.—La Compagnie Francaise pour l'Exploitation des Procedés Thomson-Houston, of Paris, is increasing its capital from 250 to 300 million fr. by the issue of 1,000,000 new shares of 500 fr. each, which are being offered for subscription at a premium of 45 fr., that is, at 555 fr.

Brisbane Electric Tramways Investment Co., Ltd.—Preference dividend for the eighteen months to June 30th, 1924, is announced.

Vickers, Ltd.—Dividends are announced on the preferred stock and preference shares for the half-year ended June, 1924.

Chatham and District Light Railways Co.—Dividend of 5 per cent. per annum, less tax, on the ordinary shares for the half-year.

Tokio Electric Light Co., Ltd.—Dividend for the half-year ended May 31st at the rate of 10 per cent. per annum.

Lancashire United Tramways, Ltd.—An interim dividend of 3½ per cent. has been declared.

Montreal Tramways Co.—Quarterly dividend of 2½ per cent., payable August 1st.

Lanarkshire Tramways Co.—Interim dividend of 3½ per cent., less tax.

Rushden and District Electric Supply Co., Ltd.—The directors have declared an interim dividend of 3¼ per cent.

Stocks and Shares.

MONDAY EVENING.

STOCK Exchange men frankly admit that the course of the world's happenings is not in favour of their markets. Possibly it is just as well that the holidays should be upon us, because nobody expects to do very much in the City during August, and accordingly, the various factors which make for disturbance financially and politically, will be less noticed at this season of the year than they might be at a time when the Stock Exchange expected to be busy. Money rates are moving in a manner which suggests that the anticipated rise in the Bank Rate cannot be long postponed. The various rifts in the Peace Conference lute tend to check confidence, and any semblance of activity. The mysterious revolution in Brazil, and the uncertainty of the position in Mexico, operate against investment or speculation in the issues connected with both those countries. There is more doing amongst Home Railway stocks, and this market makes a bright spot in other-

wise dull investment departments. Substantial rises in the metal market, especially in zinc and lead, said to be due largely to demands by the electrical trades, have their appropriate effect upon shares of the companies connected therewith.

Metropolitan Consolidated stock fell back, on the announcement of the 2 per cent. actual dividend which fulfilled the general prophecies made in advance. The price of the stock had been up to 82, but there was the usual profit-taking after the declaration, and the price has fallen to 81½. The dividend is an improvement of ½ per cent. upon that of last year, and is taken as a precursor to a probable increase of similar amount in the final dividend, which, if it materialises, will give Mets. 5 per cent. for 1924, as against 4 per cent. paid in 1923. The Exhibition is the obvious reason for the impetus given to the company's earnings, and some people ask whether this source of income can be depended upon with any degree of assurance. To which the answer is that, if the Exhibition is continued next year, although it will not attract the same number of people as it is doing now, the Metropolitan traffics should be good enough to warrant the maintenance of a 5 per cent. dividend. This is looking ahead a good way, and probably the supporters of Metropolitan stock lean more upon the hope of the company being taken over by the Great Western, or the London, Midland and Scottish, at a good price than they do upon the Exhibition. Districts are better at 50½ and the Underground Electric stocks are rather harder.

Power shares show a tendency to improve. Yorkshires are strong at 26s.; Lancashires have risen to 25s.; Egham and Staines Electric Supply are being taken by investors, at £1. For 1921, 1922 and 1923 the dividend was 7½ per cent. each year. It is paid annually, in March. Scottish Power ordinary keep steady at 23s. Power Securities Corporation 7 per cent. participating preference, offered at 24s., yield £5 16s. 6d. per cent. on the money.

In the electricity supply list, Metropolitans are lower at 1½, this being the only change worth noticing amongst the ordinary shares. North Metropolitan 6 per cent. preference rose to 22s. 6d.; Newcastle 7 per cent. preferences are also 1s. higher at 25s. 6d. Whitehall 7½ per cent. preference fell to 19s., to recover to 19s. 6d., which leaves them a little better on the week. The company's debentures are also higher at 95¼. The new preference continue dull at 19s. 1½d., though the debenture, issued at the same time, has recovered to its "par" price of 94.

Other new issues are still on the dull side, as the Stock Exchange says. There is a lot of undigested stock about, and until some of this becomes more firmly placed, it cannot be expected that there will be any noticeable recovery in prices. South Wales Electric preference have hardened to 1¼d. discount. West Gloucestershire 6½ per cent. preference are 1s. 6d. discount and the 5½ per cent. mortgage debentures 3 discount. Shropshire debentures are a good market at 3¼ premium. British Automobile Traction 5½ per cent. debenture, issued at 95, continues dull at 3½ discount. British Insulated 5 per cent. debenture, which came out at 98, hardened to 1½ premium. The Barcelona Traction 6½ per cent. bonds stand at a discount of 4½ on the issue price of 91.

One of the lively features of the markets is the strength of Canadian Marconi shares. These have risen to 5s. 10½d., and the Marconi group as a whole is better. Marconi Parent shares, although nominally unchanged at 1 9/16, are nearer 1¾. The company's debentures strengthened to 103¼. These advances are due to the announcement by the Government of the arrangements which it is proposed shall be made in regard to the new stations that are to be erected. It is thought that the Radio Company will benefit substantially, and the price of the ordinary rose to 23s. 6d., the preference stiffening to 19s. 3d. Meanwhile, cable stocks are leaning to the lower side, with small falls in Eastern ordinary and in Western Telegraphs. Globe preference, however, advanced to 11¼. Chili Telephones are now ex rights, and at 5½ have attracted a little attention from those who regard the shares as looking cheap in their new guise. Anglo-American preferred at 102½ is ex dividend.

Mexican Light and Power issues failed to benefit from the issue of the report, which shows expansion in business, but reflects the unsettled conditions that continue to prevail in the country. When the political settlement does come in that country, it is obvious that the utility companies are likely to go ahead rapidly, though it must be confessed that the character of the news during the past few weeks from Mexico does not hold out encouragement for an immediate improvement.

Brazilians are flat, Brazilian Tractions dropping 4½ to 49, the preferred being lowered to 95. News is extraordinarily scanty, and a good deal of the pessimism which proceeds from New York is received with a good deal of caution. At the same time, holders of Brazilian securities are nervous and apprehensive, which is not surprising in view of the manifestly serious character of the revolutionary outbreak.

Manufacturing shares show an inclination to sag. Metropolitan-Vickers ordinary changed hands at 18s. 9d. Electric Constructions have gone back to 28s. 9d. and General Electrics to 17s. 9d. The telegraph group in this department maintains its strength. Rubber shares are firm, the price of the produce being a shade over 1s. per lb. Babcock & Wilcox keep about 27s. 6d., and other shares in the same market have moved but little.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom. £	Dividend. 1922.	Dividend. 1923.	Price July 28, 1924.	Rise or fall.	Yield. p.c.
Brompton Ordinary	1	12	10	37/-	—	*5 8 1
Charing Cross Ordinary	1	14	14½	42/-	—	6 18 2
do. do. do. 4½ Pref.	1	4½	4½	17/-	—	5 6 0
Chelsea	1	10	12	37/6	—	6 8 0
City of London	1	15	15	45/9	—	6 11 0
do. do. 6 % Pref. ...	1	6	6	23/6	—	5 2 2
County of London	1	10	15	49/6	—	6 1 0
do. do. 6 % Pref. ...	1	6	6	1½	—	5 6 8
Edmundson's Ordinary	8	7	7	4½	—	4 6 1
do. 6 % Pref.	5	6	6	5⅜	—	5 11 7
Kensington Ordinary	5	12	14	9½	—	7 3 7
London Electric	1	10	10	31/-	—	6 9 0
do. do. 6 % Pref. ...	5	6	6	5⅜	—	5 11 7
Metropolitan	1	8½	10	1⅜	— ⅛	6 1 3
do. 4½ % Pref.	1	4½	4½	17/-	—	5 6 0
Newcastle-on-Tyne Ordinary ...	1	2½	6	18/9	—	6 8 1
do. 5 % Pref. ...	1	5	5	17/-	—	5 17 8
do. 7 % Pref. ...	1	7	7	25/6	+1/-	5 9 10
Notting Hill 6 % Pref.	10	6	6	9½	—	6 6 4
North Met. Elec. 6 % Pref. ...	1	6	6	1⅛	+ 1/16	5 6 8
Urban Ordinary	1	—	4	18/3	—	4 7 8
do 6 % Pref. ...	1	6	6	1	—	6 0 0
St. James' and Pall Mall ...	5	14½	17½	13¼xd	—	6 12 1
South London	1	11	15	43/3	—	6 18 7
South Metropolitan Pref. ...		7	7	1⅛	—	5 12 0
Westminster Ordinary	5	12	15	10⅛	—	7 6 4
Whitehall Elec. Invst. 7½ % Pref.	1	7½	7½	19/6	+3d.	7 13 10

Home Rails.

Central London Ord. Assented Stock	4	4	68½	—	5 16 10
Metropolitan ... ... ,,	3½	4	81½	+ ½	4 18 2
do. District ... ... ,,	3	3½	50½	+ ⅛	6 18 7
Underground Electric Ordinary	10	Nil	Nil	2½	—	Nil
do. do. "A" ...	1	Nil	Nil	7/6	—	Nil
do. do. Income Bonds	5	6	99	+1	*6 1 5

Telegraphs and Telephones.

Anglo-Am. Tel. Pref. ... ... Stock	6	6	102½xd	—	5 17 0
do. Def. ... ... ,,	1½	1½	23⅞	—	6 6 4
Chile Telephone	5	6	6	5½xd	—	5 9 0
Cuba Sub. Ord.	10	7	7	7	—	10 0 0
Eastern Extension...	10	10	10	16	—	6 5 0
Eastern Tel. Ord. ... ... Stock	10	10	161½	—1	6 3 10
Globe Tel. and T. Ord., ...	10	10	10	17½	—	5 14 3
do. do. Pref.	10	6	6	11½	+ ⅛	5 6 10
Great Northern Tel.	10	24	22	27½	—	8 1 6
Indo-European	25	7	7	33½	—	*5 6 1
Marconi	1	15	—	1 7/16	—	9 12 6
Oriental Telephone Ord.... ...	1	12	12	1⅞	—	*6 3 0
United R. Plate Tel.	5	8	8	6⅞	—	*5 18 6
West India & Panama	10	Nil	Nil	1/-	—	Nil
Western Telegraph	10	10	10	16½	— ½	6 4 1

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	12½	5½	8 3/16	—	8 12 6
do. do. 2nd Pref. ...	5	5½	6	2 1/16	—	10 4 4
do. do. 5% Deb. ... Stock	5	5	73½	—	6 16 6
British Electric Traction Ord. ... ,,	6	6	92½	—1	6 9 9
do. do. 6% Pref. ... ,,	6	6	103	—	5 16 6
Brazil Traction 100	4	4	49	—4½	8 3 4
Brit. Columbia Elec. Rly. Pce. Stock	5	5	87½	—	5 14 3
do. do. Preferred ,,	5	96/-	83½	—	*6 5 8
do. do. Deferred ,,	8	127/-	102½	+1	*6 6 0
do. do. Deb. ,,	4½	4½	81½	—	5 4 4
Lond. & Sub. Trac. 5 % Pref. ...	1	5	2½	6/-	—6d.	8 6 8
London United Tram. Deb. ... Stock	4	4	47	—	8 10 2
Mexico Trams. 5% Bonds ... —	Nil	5	67	—1	7 9 3
do 6% Bonds ... —	Nil	Nil	46½	—	Nil
Mexican Light Common ... 100	Nil	Nil	16	—	Nil
do. Pref. 100	Nil	Nil	43	—	Nil
do. 1st Bonds ... —	5	5	63½	—	7 17 6

Manufacturing Companies.

Babcock & Wilcox...	1	20	12	47/6	—	*5 1 2
British Aluminium Ord.... ...	1	5	5	25/9	—	3 17 8
British Insulated Ord.	1	15	15	2⅜	—	5 14 3
Callenders	1	15	15	52/-	—	6 15 5
do. 6½ Pref....	1	6½	6½	23/3	—	5 11 10
Crompton Ord.	1	5	Nil	⅞	—	8 17 10
Edison-Swan	4/-	7½	—	5/-	—	6 0 0
do. ,, 5% Deb. ... ... Stock	5	5	75½	—	6 13 5
Electric Construction	1	10	10	1 3/16	— 1/16	6 19 0
English Electric	1	8	8	15/9	—	6 7 0
do. do. Pref.	1	6	6	19/6	—	6 3 1
Gen. Elec. Pref.	1	6½	6½	23/-	—	5 13 1
do. Ord.	1	5	5	17/9	—6d.	5 12 7
Henley	1	15	15	2½	—	5 14 6
do. 4½ Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	10	5	½	—	*7 5 6
Met.-Vickers Pref....	3	8	8	9 7/8	—	6 11 3
Siemens Ord.	1	5	—	18/9	—	5 6 8
elegraph Con.	12	20	20	24½	—	*4 17 7

* Dividends paid free of Income Tax.

Refrigeration and Electric Power Supply.

THE fourth International Congress of Refrigeration was held in London from June 16th to 27th, under the auspices of the International Institute of Refrigeration. There was a large number of delegates from some 30 countries, and many papers were presented.

One of them, under the above title, by Mr. L. R. Morshead and Mr. W. M. Selvey, constituted a plea for co-operation between the electricity supply and refrigerating industries, to their mutual advantage. It was suggested that in all but a few cases the methods in existence of charging for electric power did not properly recognise the special nature of the refrigerating load. This was flexible and adaptable to the requirements of the supply station, and power could be produced for this particular supply at low cost. The authors stated that though the progress of the industries concerned in the production of cold and of electric power up to the present stage contained many elements of similarity, they had developed until recently on entirely independent lines. The great development of electric power supply had step by step brought about such reductions in the cost of power that the public supply undertaking was now able to offer such terms to the ordinary power users as made electric power almost the only one to be considered where a substantial supply was available. This had led many proprietors of cold stores and ice-making plants to change over from their private power installations—steam, gas, or oil—to electric drive from the public supply. The availability of electric power supply had made possible refrigerating installations which could not have been successful on the higher capital and operating costs involved in the private power installation, and had also enabled considerable developments to be carried out in existing refrigerating plants which for reasons of space, &c., could not otherwise have been developed. The close co-operation of refrigerating and power supply engineers would result in a realisation of the great possibilities which existed for development to the advantage of both industries.

The electric power engineer had generating capacity, and to spare, at those times when refrigerating engineers most particularly required it, while on the other hand, by very slight modifications in the methods of operating refrigerating plants, it could be so arranged that a very small demand was made on the public supply at those times when the electric power engineer was most pressed by the general demand. Given mutual accommodation on the above lines, a case could be made out even in very small refrigerating installations for the supply to the refrigerating engineer of electric power at very attractive prices.

The authors exhibited examples to show that the load curve of the power demand of a large refrigerating business was strikingly different from the general power demand curve, the principal demand occurring in the summer months and the lower demand in the winter. The refrigerator load curve, given a sufficient development of the industry, would be almost the reciprocal of the general power load curve. In some of the largest American cities in which the uses of electricity and refrigeration had been highly developed, the power demand for refrigerating purposes in summer equalled the demand for electric power for heating and cooking in the winter, and the combined demand was practically constant throughout the year. Energy was supplied at a very low and yet profitable rate, and ice was produced so cheaply that it hardly paid to harvest the natural ice. In this country, with its present limited use of public power supply and of refrigeration, with its different climate and the different habits of its people, such a convenient state of affairs might appear almost unattainable. Nevertheless, much could be done towards the obtaining of such advantages to both industries as were possible.

If rates were so fixed that equal profits were earned on all classes of supply, there would be small difficulty in showing that refrigerating loads should receive very much more favourable treatment than at present, as refrigerating industries undoubtedly constituted a unique class. A justly calculated rate for a supply at all times of a long-hour nature, as a maximum in the summer months, and arranged as an "off-peak" load in the winter, would be so reasonable that it would be a competitive power rate in all places where a public supply of electricity was available.

The author then quoted some tariffs which had been arranged in certain cases of conversion of refrigerating plant from private power to the public electricity supply, or for a supply to a new factory.

EXAMPLE A.

In a Midland town a supply of electricity from a large municipal power station was, after considerable discussion, agreed for the purpose of cold storage and ice manufacture, to the extent of 600 h.p., at the following tariff :—

Scale of charges for high-pressure energy, *i.e.*, basic price :—

Up to	20,000 kWh	0.85d. per kWh
" "	40,000 "	0.80d. " "
" "	80,000 "	0.75d. " "
" "	120,000 "	0.70d. " "
" "	160,000 "	0.65d. " "
Above	160,000	0.60d. " "

When the average cost of coal exceeds 9s. per ton the above rates are subject to an increase of 0.015d. per unit for each 6d. per ton above 9s. per ton.

DISCOUNTS.

(*a*) *Load Factor.*

When the load factor reaches 40 per cent., 5 per cent. discount off the monthly account.

When the load factor reaches 60 per cent., 10 per cent. discount off the monthly account.

When the load factor reaches 70 per cent., 12½ per cent. discount off the monthly account.

When the load factor reaches 80 per cent., 15 per cent. discount off the monthly account.

(*b*) *Power-Factor Discount.*

If the consumer installs special plant to secure high average power factor, additional discounts are allowed as follows :—

When the average power factor exceeds 0.85 (lagging), 3 per cent. discount.

When the average power factor exceeds 0.90 (lagging), 5 per cent. discount.

(*c*) *Restricted Hours.*

The consumer having agreed not to take a supply other than for small specified requirements, between the hours of 4 p.m. and 6 p.m. during the months of October to February inclusive, a special discount of 5 per cent. off the net account is allowed.

(*d*) *Special Load Discount.*

Subject to a guarantee that the consumption during the six summer months will equal 60 per cent. of the total annual consumption, a discount of 10 per cent. is allowed off the basic price per kWh.

(In practice the average price for the first year's run, which included the change-over period, has worked out at 0.80d. per unit, but it is anticipated that this will be considerably reduced now that the whole of the plant is in operation.)

EXAMPLE B.

In a large North-East town with a moderately large power system the following consolidated tariff was arranged, which is now being used to the extent of 1,500 h.p., supplying ice-making factories :—

Price per kWh 0.52d. for the first 2,000,000 kWh.
Price per kWh 0.36d. for all above 2,000,000 kWh.
+ or − 0.012d. for each full 6d. per ton by which the price of coal delivered at the power station varies from the basic price of 10s. per ton.

(For the year 1923, on a consumption of less than 4,000,000 kWh, the average price worked out at 0.564d. per kWh, a figure which will be reduced during this year's run.)

EXAMPLE C.

In a small town in the East Midlands, a tariff for cold storage and ice-making to the extent of only 70 h.p. has been arranged :—

Basic price per kWh 1.51d. to 1.4d. according to load factor each month.

Special discount of 60 per cent. on account of special nature of demand and terms of contract, which include the following :—

(1) No power supply to be taken between the hours of 3.30 p.m. and 6 p.m. during the months of November to February inclusive.
(2) Power factor is to be maintained at 80 per cent. or over.
(3) Maximum payment to equal £5 per kW maximum demand, per annum.
(4) Price is based upon coal at 24s. to 25s. per ton, and is subject to 0.001d. per kWh rise or fall for each 1d. per ton by which the cost of coal rises or falls from the said basis.

In the case of a new refrigerating undertaking, said the author, there was no doubt that where a suitable public supply was available the designer of the undertaking would consider first of all the installation of electrical driving on account of the lower first cost, greater simplicity of the layout, small space occupied, general convenience in operation, the saving of labour, and the greater reliability of a public supply with its large reserves of plant.

As to the cost of conversion of existing steam, gas, or oil installations to electric drive, this was not, as a rule, difficult to estimate, and the authors gave actual cases of conversion.

The use of refrigeration in the power station itself had from time to time received consideration, and was actually applied in a few cases on the Continent and in America, but there had not been so far any development in this country. This lack of development was due, in the authors' opinion, to the fact that refrigeration had always been studied from the plant designers' point of view alone, and it had not seemed possible to justify the installation of refrigerating plant for one purpose only, such as, for example, the cooling of alternators. The high capital charges on the plant made the proposals uneconomical, but if these capital charges could be otherwise met, the running costs would probably be less than the economies which would be effected by a proper use of refriger-

ation. To cover capital charges the refrigerating plant might be utilised for other purposes, cold storage and ice-making being two obvious lines. The plant would be worked during the station light-load periods and as far as possible kept off the peak loads, whilst during these peak loads the reserve of cold built up during the light-load periods in brine and other media could be used for the cooling of the ventilating air of turbo-alternators, for the cooling of oil, &c.

In electrical design, lower temperatures of ventilating air meant a better use of materials, control of overload capacity, smaller masses of iron and copper, smaller ventilating ducts and spaces, and possible radical modification in design with increase in efficiency. This applied particularly to the design of 3,000-r.p.m. turbo-alternators in which the problem of supplying air in sufficient quantity to remove the heat generated in resistance losses in the copper and hysteresis losses in the iron had constantly attracted the designer and engineer. Much ingenuity had been displayed in dealing with this problem, but there was still room for improvement. The limiting factor in the design of the large modern high-speed turbo-alternator was the area of gaps and ducts to be allowed for the necessary volume of air required for the cooling of the machine, and particularly for the cooling of the rotor. The lowering of the temperature of the inlet air to the alternator would enable cooling to be effected with smaller volumes of air, or conversely, allow of the extraction of greater quantities of heat with the same volume of air and the same area of ducts.

The modern practice in alternator cooling was the closed-circuit system. This had the advantage that the air filter was practically eliminated and the alternator was cooled by clean air, but it had the disadvantage that the whole of the temperatures in the machine were put up by from 10 deg. F. to 15 deg. F. The authors were of the opinion that the day of the wet-air filter was not yet over, and that fresh air at atmospheric temperatures would still be passed through the water screens to remove dirt, and would then be cooled by brine coils to the desired point, both temperature and humidity being under control. They visualised the large generating stations of the future developing with their electrical generating units refrigerating plants of considerable capacity and attracting to their immediate neighbourhood industries which demanded not alone supplies of electrical energy, but cold in the form of fluid or gaseous media for the extraction of heat for use in various processes.

The Personal Element in Public Utility Advertising.

In the course of his paper, which was read at the recent International Advertising Convention, Mr. E. Boys, secretary of the North Metropolitan Electric Power Supply Co., said that public utilities still required and probably always would require advertisement, and it was only a question as to the form most useful, not only for the undertaking, but for the information and benefit of the user as well.

Every utility undertaking offered something to the ratepayer which he could not produce himself, and which was certainly indispensable to him; yet he regarded the public utility as something mainly to grumble at and depreciate without a thought as to how cheap was the service always at hand. It was necessary to find ways and means of convincing the public of the merits and value of these utilities. The present British methods were not sufficient, but American commercial advertising methods generally would not bring the British public into a quick and lively appreciation of all that public utilities stood for within the shortest possible time and at the least expense.

In the electricity supply industry there were the supply authority, the manufacturer, and the contractor. In addition, there was the consumer who was very ignorant of what the industry could do for him. The obvious solution was co-operative advertising by the industry as the foundation, with individual publicity by each of the sections within the industry. While the broad principles of advertising applied to the sale of all commodities and service, there was necessarily some difference in methods conditioned by the nature of what was to be advertised and the class of people to be addressed.

Unfortunately, in transport and in lighting, there had been far too much put into print in the shape of by-laws and regulations which amounted to restraints and obstacles which rather warned people off than welcomed them, and there were undoubtedly numbers of persons in authority who tended to handle public services rather by police methods than by popular methods.

These numbers were, however, undoubtedly diminishing. Suppliers of transport and power and light were showing an increasing disposition to come down from their cold statutory pedestals and be human. They found not only that it paid, but that it was actually more pleasant.

Pleasing the Public.

Unimaginative critics still inquired why it was necessary to keep telling the people about the Underground railways and the General omnibuses. Nearly all the passengers used them daily because they must. Presumably they would pay and suffer helplessly if the cars were dismal boxes and the stations merely dreary and dirty stepping-off places. Why was it worth while to be always trying to make things pleasanter? Was it business or merely philanthropy? It was strictly business; apart from that part of the advertising which led the public to seek fresh fields in their leisure time, the beautifying of their daily necessary journeys was remunerative. For one thing it would be far more difficult and costly to deal with a grumbling and sullen swarm of rush-hour travellers than with these outpouring and inpouring thousands who had a favourable prejudice towards the executive because they believed that it was always doing its best. That was the impression that every public utility undertaking should seek to make on the public: that it had something good to sell and that it was doing its best. One somewhat curious result that was perhaps overlooked was that the advertising of a utility company in particular had a tonic effect on the whole of the staff, and thus produced an improved personal service.

Dealing more particularly with electricity supply, the author said that the same contrasts and the same tendencies towards improvement were noticeable as were to be observed in transport work. It was but a few years ago that all the trouble of obtaining connection with public electricity mains was in most districts thrown upon the intending consumer.

Relations with Consumers.

To-day, on the contrary, in most districts emissaries of the supply authority left their fortresses daily and took up the attack instead of remaining stolidly on the defensive. Those who had no electricity were appealed to, while those who had electricity already were continuously being reminded of the manifold uses to which it could be applied. It was most important that a public utility should not be too rigidly classified as something different from other commercial undertakings. There was a well-recognised distinction in mental attitude between paying bills which represented something like solid value for money and paying bills which were of the order of rates and taxes. There was always the danger that a public utility undertaking which held itself aloof from the public would be classified as belonging to the group of official brigands represented by that unpopular term "rates and taxes"; whereas, in point of fact, at any rate so far as electricity was concerned, there was nothing that the public paid for which represented better value for their money.

Apart, therefore, from the necessity for advertising through the usual channels, the link between the utility undertaking and the public must be as perfect as possible. The servant of the undertaking who came in contact with the public had the reputation of the undertaking in his keeping, whether he was the railway servant, the sales engineer, the wireman, or the meter reader.

The Personal Touch.

The company with which the author was connected had showrooms in the majority of its districts, and it was the business of an expert lady demonstrator to go round from place to place giving public demonstrations in the use of all electrical appliances and constantly re-arrange the lay-out of the showrooms. It was also found of great advantage to keep in close touch with consumers who had purchased new apparatus; it was no advertisement to allow a consumer to install an electric cooker without being satisfied that the consumer's household were quite familiar with it and were getting the best out of it.

The company had recently obtained the contract for wiring 250 houses to be erected on a new estate, and had purchased one of the houses, electrified it throughout, and thrown it open for inspection and demonstration. (*Vide* ELEC. REV., July 11th, p. 84.) All these agencies should work together to spread the good name of the undertaking and to foster the idea of serving the public.

It was desirable that the whole of the staff of an undertaking should be familiar with all of its advertising, catch the spirit of the thing, and know the objects of the management. It was, of course, important that members of the staff, particularly those who came into contact with the public, should themselves be users of the apparatus and the energy which they wished others to buy and use. Showrooms or demonstration experience of apparatus was insufficient.

What the electrical industry as a whole was now at last seeking systematically to form was a continuously sympathetic public opinion in its favour. It had in many ways an easy cause to preach. Its claims were that it could do all manner of domestic work with much less fuss and labour and that it could thus increase the amount of leisure of those who used it.

Costs and Selling Prices of American Electrical Apparatus.

BEFORE the Electrical Power Club, Absecon, N.J., in May last, Mr. A. H. Timmerman, vice-president of the Wagner Electric Corporation, St. Louis, Mo., read a paper entitled "Are Our Prices Out of Joint?" The paper, for the following abstract of which we are indebted to the *Electrical World* of July 12th, contained a study of the relative cost of material, hourly labour and selling prices of electrical apparatus in 1914, 1920, and 1924. Of course, conditions on the two sides of the Atlantic are not identical, but the study is of considerable interest to those concerned with electrical production in this country. We quote Mr. Timmerman:—

As a result of the war labour rates were advanced to figures probably never reached before in the history of industrial organisations. A recent study made by the National Industrial Conference Board shows that the hourly rates of all industrial wage earners increased from a figure of 24½ cents per hour in 1914 to 60 8/10ths cents per hour in June, 1920. This represents an increase of 148 per cent. In other words, on the average, all industrial workers received in June, 1920, approximately two and one-half times as much per hour as they received in July, 1914.

During 1921 and the first half of 1922 this rate gradually decreased, until we find that in July, 1922, the average hourly rate of wage earners in industrial plant was only 94 per cent. in excess of the pre-war rate. From that time on, however, there has been a gradual increase, and in January, 1924, all male wage earners were receiving an hourly rate equal to 2.28 times that paid in 1914. Unskilled male labour was receiving 2.30, male skilled labour, 2.26, and women were receiving 2.59 times the pre-war rate.

Labour and Material Cut.

In July, 1914, the average hourly rate of all wage earners in electrical manufacturing was 27.2 cents per hour. The gradual increase reached a peak in December, 1920, of 62 cents per hour. From this time on until the middle of 1922 there was a gradual decrease to 49.2 cents per hour. At this point a gradual increase began until the hourly rate reached a figure of 60.6 cents in January, 1924. Taking the July, 1914, hourly rate as 100, the peak reached was 228, while the rate in January, 1924, was 223. It will be seen from this that in the electrical industry we are to-day paying virtually the peak wages of 1920, and this peak is 123 per cent. in excess of the pre-war rate.

Material costs are made up of labour, either direct or indirect, with the exception of that part which represents the cost of capital employed in industrial business. One would, therefore, expect that material prices had shown a fluctuation somewhat similar to the fluctuation shown in the cost of labour. As a matter of fact, and taking the 1920 price as 100, the 1924 index of all material used in the manufacture of a certain line of electrical apparatus is 77.67, while that of 1914 is 47.1, and the cost of the material in 1924 is approximately 65 per cent. above that of 1914. This gives an index of 77.8 per cent., which is a good check on the index of 77.67 derived by the other method. It can be said in general, therefore, that our material costs of 1924 are 78 per cent. of what they were in 1920, and 165 per cent. of similar material in 1914.

A corresponding figure for another line of electrical apparatus, quite different from the line referred to, gave an index of 80 for the 1924 material cost. It would, therefore, seem reasonable to assume in a general way that the cost of material in 1924 is approximately 78 per cent. of the cost in 1920. The problem therefore is to produce electrical apparatus to-day with hourly labour rates which are 98 per cent. of the peak figures in 1920 and material costs which are 78 per cent. of the 1920 figures. On apparatus in which labour and material enter equally there should therefore be in 1924 a labour and material cost which is 88 per cent. of the 1920 figures.

Relative Selling Prices.

Let us now examine into the relative prices at which electrical apparatus was sold in 1914 and 1920 and at which it is being sold in 1924. To make this comparison we will take several more or less distinct classes of apparatus:—

Squirrel-Cage Motors.—Assuming the selling price in 1914 as 100, we find that the relative price of a line of such motors in 1920 was 169, and in 1924 was 106. In other words, the selling price of squirrel-cage motors to-day is approximately what it was in 1914. Calling the standard of comparison (the 1920 price) 100, the 1924 price of squirrel-cage motors is 63 per cent. In other words, with an hourly labour rate of 98 per cent. and a material cost of 78 per cent. of corresponding figures in 1920, the selling price of squirrel-cage motors is 68 per cent. of the 1920 price.

Single-Phase Motors.—Assuming as 100 the 1920 price of repulsion-induction single-phase motors of 1 h.p. rating and larger, the 1924 index is 69 per cent., while that of 1914 is 58½ per cent.

Fractional Horse-power Motors.—Using prices of ¼-h.p., ½-h.p., and ¾-h.p. motors in equal quantities, for May, 1920, and May, 1924, and placing the 1920 selling price at 100, the 1924 selling price is 48, and this notwithstanding the fact that labour rates are 98 per cent. and material costs 78 per cent. of what they were in 1920.

A similar index for distribution transformers is 76.

The index showing relative costs of a complete line of alternating-current motors of all kinds and capacities within the Electric Power Club limits shows April, 1924, selling prices as 67 per cent. of the 1920 peak figures.

What is Wrong?

A first glance at the figures given would seem to indicate that the losses of the electrical manufacturers under these conditions would be very heavy. There are, however, three compensating circumstances:—

First, labour is more efficient.

Secondly, shop efficiency has been much increased.

Thirdly, re-design of electrical apparatus has made possible reductions in both labour costs and material costs.

In order to place costs and selling prices of squirrel-cage motors on the same relative basis as in 1920, it would be necessary to have reduced labour hours on a given size of frame by 25 per cent. and to have increased horse-power ratings by one size on the average. Even with this reduction in costs, the profit will be exceedingly meagre, notwithstanding the assumption that all overhead costs have been reduced on the same percentage basis. On fractional horse-power motors the situation is still more serious.

To sum up the problem: If we re-rate all frames upward one size and in addition reduce our labour hours by 25 per cent. under what they were in 1920, with material prices and hourly labour rates as they are at present, the profit will still be less than in 1920. It behoves all of us therefore to give very serious consideration to the above facts.

What is wrong with the electrical manufacturing industry that we should buy material at 78 to 80 per cent. of the 1920 prices and sell it in the form of electric motors at somewhere between 48 and 69 per cent. of the 1920 figures?

Large American Generating Sets.—The first two sets for the new 700,000-kW station to be constructed by the New York Edison Co. have been ordered. These will be single-unit G.E. machines of 60,000-kW capacity, unity power factor, 25 cycles, 11,400-V. three-phase, and will run at 1,500 r.p.m. The operating conditions will be 350 lb. pressure and 700 deg. Each will be equipped with a direct-connected exciter, and will exceed by 10,000 kW the present largest set of this type. A contract has been recently awarded by the United Electric Light & Power Co. for a 50,000-kW cross-compound turbine-generator unit which will consist of a high- and low-pressure turbine, two main generators of 25,000 kW each, and an auxiliary 2,000-kW generator directly connected to one of the main generators. The field current will be supplied to the two main generators by a large direct-connected exciter, while a small exciter will serve the auxiliary generator. The set will be installed by the company's Hell Gate station, and is made necessary by the increasing load for general light and power purposes in the Metropolitan district. This equipment is a duplicate of a previous order from the same company, which is now in the process of manufacture.—*Power.*

Municipal "Debts."—The money borrowed by progressive Canadian municipalities and by the Provinces for the installation of light and power and similar services is usually spoken of as "revenue-producing debt." We are assured from time to time that the "debt" of our municipalities is becoming a serious burden and a menace to their citizens. The use of the word debt to describe much of this capital investment is altogether misleading. When the Hydro-Electric Commission and the City of Toronto took over the Toronto power venture of the Mackenzie interests some thirty million dollars of private capital became at a stroke of the pen thirty million dollars of public debt. But there was no burden added to any taxpayer's load. The persons using light and power continued to pay interest on the public debt as they had paid interest formerly on the bonds of the power company. There was really benefit for them in the transformation of capital into debt, because the rates for energy were reduced materially when the "Hydro" stepped in. A new word is needed to take the place of debt as applied to the borrowed capital invested in revenue-producing public services.—*The Globe* (Toronto).

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus, which will be published if considered of sufficient interest.

The "Marconiphone Ideal" Distortionless Transformer.

The "Marconiphone Ideal" transformer, which has recently been placed on the market by the MARCONIPHONE CO., LTD., Marconi House, Strand, W.C.2, marks a very great stride in loud-sounding reproduction, for it is claimed that the long-sought feature of efficient and equal magnification of all notes in the musical scale has been effected.

With the advent of broadcasting, the majority of transformers were of the type used for the amplification of wireless telegraph signals, but the broadcasting of music, in which all instruments are arranged at the transmitter so as to give a true balance, clearly revealed the imperfection of these transformers (particularly on loud speaker reception) owing to the fact that the unequal magnification stressed unduly certain frequencies at the expense of the rest. This resulted in the loss of all those delicate tones and overtones which give music its charm and vitality. The usual methods of obtaining smooth amplification were either the use of damping resistances across the secondary winding or the use of a low impedance valve with a low ratio transformer; both methods are very inefficient.

The "Ideal" transformer (fig. 1) can be used with any type of valve and when used with the "L.S.5," for example,

Fig. 1.—The "Marconiphone Ideal" Valve Transformer.

will give a voltage step up of approximately 33, without in any way affecting its remarkable distortionless characteristics.

The following table of readings shows the voltage step-up obtained with a high ratio (6 to 1) "Ideal" transformer and a low impedance valve.

Frequency.	Voltage Step-up.
4,300	31.8
3,600	32.3
3,000	32.4
2,500	32.4
2,100	32.6
1,700	32.6
1,350	32.6
1,000	32.5
750	32.3
500	31.4
400	30.5
300	28.6

It should be noted that although no figures are given for the voltage amplification of frequencies above 4,300 owing to the great difficulty in making accurate measurements at these high frequencies, the amplification continues without appreciable variation right up to 10,000 cycles, thus ensuring the correct reproduction of all the higher musical notes and overtones.

These results are mainly due to the patented system of winding, which, by interleaving in sections the primary and secondary windings, and suitably spacing adjacent coils, keeps both the mutual and self capacity of the windings at a very low figure, while not introducing magnetic leakage to any appreciable extent. Furthermore, the phase shift is extraordinarily low. The iron circuit is of ample dimensions in order to avoid magnetic saturation, and is constructed from specially tested stalloy stampings. The magnetic leakage being small, the use of a screening box is rendered unnecessary, but as the instrument from a mechanical point of view needs some form of case this has been made of iron in order to trap the slight leakage field so that two transformers may be mounted very close together without any interaction taking place. The transformer is wound in three ratios, viz., 2.7 to 1, 4 to 1, and 6 to 1. The low ratio type (2.7 to 1) can be used with any type of valve and is especially recommended where a high impedance valve is used as a rectifier and where the transformer constitutes the first stage of cascade amplification. The medium ratio (4 to 1) transformer yields the maximum amplification satisfactorily obtainable from a high impedance valve, and it is also very suitable for low impedance valves used either singly or in cascade. The high ratio transformer is intended primarily for use with low impedance valves, and is eminently suitable for the last stages of cascade amplification where a large amount of power is required. It can also be used with high impedance valves in cases where absolute perfection of quality is not essential and it will then give an amplification which is much greater than that obtainable by any other means.

An Advertising Crystal Set.

In addition to the many cable and joint box exhibits of CALLENDER'S CABLE & CONSTRUCTION CO., LTD., Hamilton House, Victoria Embankment, at Wembley, the company is showing a device of a novel character. It consists of a small

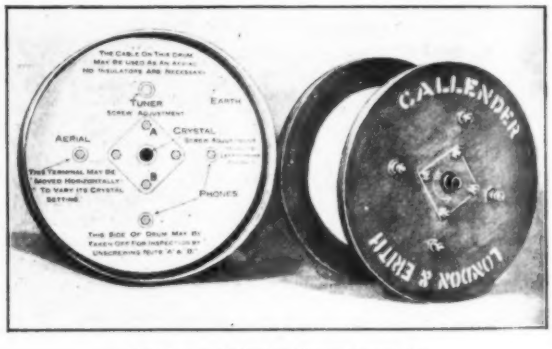

Fig. 2.—A Callender Drum Crystal Set.

model of the well-known Callender drum fitted up as a radio crystal receiver. The illustration shows the appearance of the model and the method of connecting up for receiving broadcasting. Round the drum is coiled a cable, which can be unwound and hung up as an indoor aerial where the receiving station is not too far from the broadcasting centre; for longer ranges it is desirable to use an outside aerial.

Extra-high-pressure Cable.—A new high-voltage underground cable, carrying twice as much power as any previous underground cable, was recently placed in operation in Cleveland, Ohio, U.S.A. The cable, working at a pressure of 66,000 volts, now forms part of the transmission lines of the Cleveland Illuminating Co., a subsidiary of the North-American Co. The construction of this cable was due to the need to supply power to interior territory in Ohio, Pennsylvania, and West Virginia, where water for generating plant is not available. Involved in the group connected by this project are 11 power companies. As its share in the scheme the Cleveland Co. had to tie into the overhead high-pressure lines of the Northern Ohio Traction Co., 20 miles from the Cleveland generating station. More than eight miles of this distance is in the thickly-populated residential and business sections of the city. Overhead lines being out of the question, the engineers decided to adopt a 66,000-volt cable, and a subway was accordingly built across the city with manholes at about 400-ft. intervals. The cable, about 200,000 ft. of which was used, was made by the General Electric Co., U.S.A., the Standard Underground Cable Co., and the Safety Insulated Wire Co. The finished line of cable was tested at 152,000 volts d.c., one of the recently-developed General Electric kenotron cable-testing equipments being used.

Electrical Progress and its Unsolved Problems.

By Prof. ELIHU THOMSON, M.Inst.C.E.

(Abstract of the "James Forrest" Lecture, 1924, delivered before the INSTITUTION OF CIVIL ENGINEERS.)

In 1905 Colonel Crompton delivered the "James Forrest" lecture on the subject of "Unsolved Problems in Electrical Engineering." It happened in 1900, that I was called upon to prepare for publication a brief *résumé* of electrical progress up to that time. A quarter of a century has elapsed since then, and the account may now be extended considerably in view of the great advances made in recent years. Suggestions may be made as to possible extensions in the future.

Following the lead of Colonel Crompton we may begin by giving some attention to the electricity of our atmosphere, which is made more important than ever by possible interferences with radio communication due to it.

Of Nature's electrical manifestations, the thunderstorm is the source of most difficulty in our electrical undertakings. The view now very generally adopted as to the origin of the electrification of the clouds makes it a waterdrop phenomenon —a theory proposed by Simpson. Briefly stated, it is that warm moist air from a land or sea surface, uprising to form a cumulus cloud, condenses to form drops of water which, in falling, reach such a velocity with respect to the uprising current around them that at last they are disrupted. A fine spray is torn from them and is carried upward with the uprising air. This reduces the size of the still descending drops. The spray particles appear to carry with them a negative charge, while the drops themselves are positive. As a consequence, the upper part of the rising cumulus cloud mass becomes charged negatively, and the under part, nearer the earth's surface, attains a positive electrification corresponding thereto.

This separation of the electricities on a grand scale results soon in a lightning discharge within the cloud mass itself, tending to equalise or neutralise the potentials. But the cloud is not a conductor, and the process of forming the two opposite charges goes on. If now any charged part of the cloud is near enough to earth or sea, the intense electrostatic field between cloud and earth may break down the air layer and so give rise to earth strokes of lightning. It is probable, too, that motion of the cloud masses may bring down the upper or negatively charged part to an approximation to earth at a location more or less distant. There would result from this the often observed long horizontal flashes from cloud to cloud. Further, in this last condition of oppositely charged cloud above the ground or sea, it is easy to conceive that a stroke to earth from (for example) a positively charged cloud layer may be accompanied by a discharge at or about the same instant from the negatively charged cloud, reaching earth thereunder, and that this double discharge can so serve as a shunt by earth instead of a direct discharge between the cloud masses concerned. The double discharge may thus constitute the easier path. The phenomenon of the so-called "return stroke" would thus be accounted for.

The question whether, in the lightning flash, we have to deal with rapidly oscillating currents, or merely a steep wavefront discharge in one direction, has not been solved directly. From the conditions governing oscillation and the frequency thereof, it seems altogether improbable that high-frequency oscillations could occur in lightning.

In severe thunderstorms it is often observed that a number of consecutive discharges come down the same path, or that the hot ionised air streak, displaced sidewise by the wind, gives rise to the so-called ribbon lightning. These discharges are peculiarly dangerous to life and property. A single discharge may not start a fire, but repeated discharge is liable to do so. There is evidence to show that the hot path of a discharge may in a high wind be displaced a number of feet laterally and yet be followed by a subsequent discharge or discharges. A peculiar menace exists in such cases.

Colonel Crompton in his lecture drew attention to that mysterious effect called "globular lightning." I have for many years collected accounts circumstantial and apparently reliable, that compel me to admit the existence of this mysterious form of electric manifestation, not as yet explained and never so far really reproduced in the laboratory.

With regard to damage or shutdowns of high-pressure transmission systems by lightning effects, it has been assumed that as the voltage has been increased progressively, until now we have systems operating at 150,000 or even over 200,000 volts, trouble from lightning may be expected to diminish. It would certainly be reasonable to assume that the nearer the operating voltage approached that of the lightning discharges themselves, the less likely would the surges induced by atmospheric electricity be great enough to overcome the superior insulation required for the normal current of the transmission itself. As yet this may be classed as an unsolved problem in the absence of more data.

Other very interesting natural disturbances which are of undoubted electric origin are the so-called magnetic storms and auroras.

The idea that there existed some connection between magnetic storms and also between the great auroras on the earth, and those great solar outbursts, or sun-spots, was present with a few scientific men as long ago as half a century or more. Myself a pronounced exponent of the hypothesis for about 50 years, it was a source of satisfaction to find at last that owing to statistical studies, chiefly by Schwabe, the coincidence of solar outbursts, indicated by the formation of spot areas, with magnetic storms and with auroras was established as a fact in recent years.

Dr. Geo. E. Hale, of the Mount Wilson observatory, has shown that the sun-spot areas are regions of revolving ionised streams, which cause the spots to possess local magnetic fields or cores above them. These are, as discovered by Hale, readily detected by examining the spectrum of the light from the spot, in which the Zeeman effect is shown as proof of the existence of a strong magnetic field.

It would seem that from or near the spot areas, streams of electrified particles are projected at a high rate of speed (possibly between 1,000 and 2,000 miles per second).

If the earth is moving in its orbit near such a stream, it is easy to understand that, although an aurora may not result, a disturbance of the magnetic field of the earth by induction is inevitable, since the stream of electrified particles from the sun must act as an electric current in space. This passes, not over, but near, the earth. When, on the other hand, the earth is in the way, immersed in the stream, our outer thin envelope of gas entangles the electric particles, with the result of a decided elevation of charge or potential of the outer partially conducting layer above 50 to 60 miles high. This imparted charge may perhaps be carried around with the revolving earth, so that on the dark side away from the sun a discharge takes place into the shadow of the earth, continuing until the received charge is exhausted or there is no further entrance or absorption of ions on the illuminated side. This is, of course, only hypothesis, but as reasonable as any so far offered. This would account for the fact that most short-lived auroras begin in the evening—the auroral light being, of course, the luminous effect of the moving charges, which seem to leave the earth in streamers sometimes hundreds of miles in length, nearly vertical to the earth's surface. Such streamers have their lower ends or origin in a layer of air about 50 miles high, and the apparent movement or development is outward from the earth. The direction of these streamers of the aurora would be modified by the magnetic field of the earth, and that field be correspondingly disturbed reactionally. This would apply equally to both the entering and the leaving charges, accounting for the magnetic storm as an accompaniment of a great aurora.

The induced effect on the land lines of telegraphs during the prevalence of the disturbance would thus also be accounted for. The hypothesis here presented has much of novelty in it, but the proof or disproof will remain presumably an unsolved problem for some time to come.

The old phenomenon of St. Elmo's fire, about which there need be no mystery, has in late years had a counterpart in what is known as "corona" surrounding electric lines at high voltages, and tending to set a limit to the voltages which can be used.

It is somewhat weird to watch the effects of the increase of voltage from 100,000 to 200,000, 300,000 and so on up to such a high electric pressure as 1,000,000 volts; and especially of the growth of the depth of the coronal layer, in the dark. The purplish sheath of fire expands, with every step in applied voltage, until it reaches outward from the metal conductor on which it forms to ¼ or ½ metre away—St. Elmo's fire on a large scale. This condition may at last be terminated by a discharge joining terminals distant from each other 4 metres or more, a sinuous spark resembling a lightning discharge.

Transmission of Energy.—In the broadest sense, all transmission of energy must now be regarded as fundamentally electric, since all properties of matter are now seen to depend on the electric constitution of the atoms and molecules, composed, as they have been shown to be, of negative electrons and positive nuclei or protons. It is through the interaction of the fields, electrostatic and magnetic, due to these electrons that energy is stored or conveyed, and perhaps also that the stability of atoms and molecules is secured. This is, indeed, a wonderful and far-reaching revelation or generalisation. Under it there is no escape from the conclusion that all actions of whatever kind, all properties, physical, mechanical, electrical, or chemical, are based upon and governed by electrons —free or united in systems. All energy, potential or kinetic, must in the same broad sense be fundamentally electric, residing in the motion of groups of electrons relatively to others, and in the fields, electrostatic, magnetic, or gravitational, accompanying and dependent on them. However, the greatest of unsolved problems still lies in the mystery of positive and negative charges, or in electrification itself.

It has long since been pointed out that in all cases of electric transmission, whether of large or small amounts of energy, the flow of energy itself is not in the conducting wire but in the space surrounding it; that the wire is in fact only a guiding core, as it were, leading the energy to its destination. The electric disturbance in the space around the conductor is carried, practically without loss, in the space itself and is in the form of electric and magnetic stresses (electrostatic and magnetic field) representing energy imparted to the system from the transmitting end or source, and transmuted at the receiving portions of the system into heat, light, motion, or chemical action. The voltage of the transmission is a measure of the intensity of the electric field developed in the space around the wire, while the value of the current which flows is a measure of the magnetic field-density in the same surrounding space.

In the ordinary case of transmission by low-frequency currents, the losses do not include radiation of energy into the space surrounding the lines, as such loss is entirely negligible. At high frequencies, however, the loss by radiation rises to a measurable quantity, and at the highest frequencies practically all of the energy may, according to the disposition of the apparatus, be radiated. In such a case as in wireless transmission no return conductor exists or is needed.

The simple vertical wire antenna, grounded at its lower end, with high-frequency currents applied in any way to it, becomes a radiator into the surrounding space of an amount of energy depending on its frequency rate, its height, conductivity, &c., which energy is guided in its spread outward by the conductor constituted by the earth or sea surface itself, and hence must follow the curvature of the earth.

In the past few years the advances made in this form of electric transmission have been very great, and have given rise to a new art of unprecedented importance to the future.

In all wireless transmissions the surface of the earth, the land and sea, constitutes as stated the *guiding conductor*, and, as in the ordinary transmissions by wire, the energy flows in the surrounding space and follows most naturally the curvature of the earth. Were the earth a smooth sphere of copper surrounded by a high vacuum, the conditions for such transmission would be as perfect as possible.

Interferences and imperfections, however, occur from irregular conditions of land surface, and electrical discharges such as lightning. These interfering actions still present problems to be solved in the future.

The phenomenon of "fading" as it is termed is still also an unsolved problem of radio communication. About a year ago I observed that, while the crashes from a distant thunderstorm were heard in the radio receiver with each stroke of lightning (confirmed later by the actual flashes of light appearing on the distant horizon simultaneously with the crashing sound in the receiver), there was fading just before the lightning discharge with recovery within a few seconds thereafter, and this action was repeated over and over again, so that it became easy to predict when a lightning discharge in the distant storm was about to occur in advance of its actual occurrence. This was during the transmission of music from a station 200 miles distant. The thunderstorm was located between the receiving and transmitting stations. I am therefore disposed to think that the electrical condition of the lower atmosphere between stations has a commanding influence on the possibilities of radio-transmission, such influence being generally inimical, perhaps by displacing phase-relations.

In dealing with high-frequency currents it is well to note that we can entirely dispense with magnetic cores of iron and use open coils with air or space cores only. If, for example, we are operating with a frequency of 50,000 cycles as against 50 cycles, we are employing the magnetism of the core one thousand times as often in the former as in the latter case. Although the air may be assumed as magnetically permeable roughly only a thousandth of iron, it is evident that the energy effect will be made up by the greater frequency of its use or operation of the air as a magnetic core We are not, however, restricted in this way, for in the absence of the iron core we can, without sacrifice of essentials, so enlarge the area or cross-section of the air core, without adding to cost, that even at 10,000 cycles, iron may be dispensed with. This is a principle which is utilised in the Northrup induction furnace, to which reference will be made later.

(To be concluded.)

The Progress of Czecho-Slovakia.

MR. E. C. D. RAWLINS, H.M. Commercial Secretary at Prague, considers it very doubtful whether Czecho-Slovak machinery will continue to hold its own abroad. In his recent report * he points out that in order to help the machinery industry to compete in the world's markets, Czecho-Slovak ironworks supplied pig-iron at prices far below those ruling on the international market. But the price of material only forms a small part of the cost of production, which has recently been higher than at any time since the formation of the Republic.

The Commercial Secretary states that the electrification of the central Bohemian railways is receiving detailed consideration; and when the system to be employed has been decided upon it will be put into operation first on the Prague-Plzen line, and subsequently extended to Prague-Kolín, Prague-Kladno, Prague-Benesov and Prague-Hradec Králove.

With regard to wireless and telephones, he reports that the central wireless station of 100 kW at Podebrady is expected to be completed in the summer of 1924; meantime an apparatus of 5 kW at Podebrady is in communication with England, France, Switzerland and Rumania. Additional dispatching stations of 5 kW have been built at Bratislava and Kosice, and stations of 1 kW at Kbely aerodrome, Brno and Carlsbad. Receiving stations for Press messages are situated at Prague, Brno, Carlsbad, Aussig, Reichenberg, Mahrisch Ostrau, Bratislava and Kosice. There is also a military station of 10 kW at Prague, which will probably be taken over by the Post Office. A private Czecho-Slovak broadcasting company called the Radio Journal has been established, and this business may be expected to develop considerably. A British automatic telephone company has recently concluded a 10 years' agreement with the Telegraphia Company, representing the Post Office, for the local manufacture of its patents, thus opening up a new field for British electrical enterprise.

Czecho-Slovak foreign trade last year showed an apparent favourable balance of 2,389 million Czecho-Slovak crowns,† the details of exports and imports being as follows:—

	Weight in tons.	Value in Czecho-Slovak Crowns.
Exports	11,309,722	12,518,613,927
Imports	4,191,382	10,129,589,020

Compared with previous years the trade balance for 1923, expressed in dollars, was more favourable than in any year save 1922, a result which may be considered satisfactory in view of the industrial crisis that prevailed throughout the period under review. The *Central European Observer* publishes an interesting table showing the principal countries participating in the trade with Czecho-Slovakia. They were as follows, the figures in brackets showing the percentage share:—

	Exports to (in millions of Czechosl. Crowns).	Imports from
Austria	2,639 (21.08)	665 (6.57)
Germany	2,554 (20.40)	4,133 (40.82)
England	1,216 (9.72)	337 (3.32)
Hungary	714 (5.70)	353 (3.49)
U.S.A.	557 (4.45)	714 (7.05)
Jugo-Slavia	548 (4.38)	278 (2.75)
Switzerland	487 (3.89)	215 (2.12)
Italy	464 (3.71)	463 (4.57)
Rumania	405 (3.24)	186 (1.84)
Poland	358 (2.86)	378 (3.73)
France	302 (2.41)	354 (3.49)
Holland	232 (1.85)	415 (4.10)
Belgium	96 (0.77)	80 (0.79)
Other Countries ...	1,994 (15.54)	1,558 (15.38)

Nearly a third of Czecho-Slovakia's import trade consists of raw cotton, raw wool and yarns of those materials. Grain, flour, fats and cattle are the next largest items. Imports of metals and manufactures total nearly three million crowns in value, whilst those of iron and hardware were only slightly less than that figure. Machinery and apparatus was brought from abroad to the value of 200 million crowns, and in addition electrical machinery and instruments to the value of just over 100 million.

Electrical Trade.

The report does not give any details of the electrical trade and industry but this omission may be made good by reference to an account recently sent to Washington by the United States Consul at Prague. He states that generally unfavourable conditions prevailed in the Czecho-Slovak electrical industries during 1923. Owing to the uncertainty of the local demand for equipment, which was far below that of 1922, there was little construction of new factories or additions to existing establishments.

Imports of electrical apparatus and supplies into Czecho-Slovakia last year were valued at 104,973,000 crowns, compared with 206,147,000 crowns in 1922, the most noticeable decreases being in the imports from Germany, which fell from 118,090,000 crowns in 1922 to 44,419,000 crowns in 1923. Imports from Austria also fell off about two-thirds, while ship-

* Department of Overseas Trade, 1s. 6d.

†The average sterling value of the crown was 970 in 1922 and 785 in 1923.

ments from Hungary dropped to less than 25 per cent. of the 1923 figure. The Consul says that the decreases in the imports in 1923 were due to the smaller demand for electrical equipment both locally and for re-export.

The country's total exports of electrical material and equipment during 1923 were valued at 22,303,000 crowns as compared with 63,642,000 crowns during the previous year. The principal decrease was in the trade with Germany, which declined over 90 per cent. during 1923. The development of electrical industries in Austria and Hungary, it is pointed out, tended to deprive Czecho-Slovak exporters of their former trade. There were, however, some considerable shipments of electric lamp bulbs and lighting fixtures to the United States.

In conclusion, the Consul remarks that "Czecho-Slovak manufacturers are beginning to realize that the possibilities of improving export trade in electrical equipment are small, since the country is unable at present to compete with Austria and Hungary. A rejuvenation of the German electrical industries would provide keen competition from that source. Trade with Russia in electrical lines has been hoped for, but recent political developments in that country and the action of other European countries in extending recognition to Soviet Russia have to a great extent dispelled such hopes. Prospects for the year 1924 do not, therefore, appear bright, except in certain limited lines in which Czecho-Slovak manufacturers excel."

Parliamentary.

[By Our Special Parliamentary Reporter.]

Lanarkshire Hydro-Electric Power Bill.—This Bill, providing for the incorporation of the Lanarkshire Hydro-Electric Power Co., and empowering that company to utilise falls on the river Clyde, near Lanark, for the purpose of generating electricity, was considered by a Committee of the House of Commons on July 23rd During the proceedings before a House of Lords Committee, earlier in the session, which were reported in the ELECTRICAL REVIEW for May 16th and 23rd last, there was considerable opposition by riparian owners and others to the proposals of the Bill, but in these proceedings it was opposed by only one riparian owner, who objected to a monopoly being given to the promoters, and urged that he himself should have the opportunity of putting forward a scheme for the utilisation of the power at the falls.

Mr. W. E. TYLDESLEY JONES, K.C., who appeared for the promoters, said that the Bill was promoted by several directors of the Power and Traction Finance Co. It was proposed to provide a model hydro-electric installation which could be shown to those interested in hydro-electric schemes as an example of what Great Britain could do. The power at three falls would be utilised, namely, the Bonnington Falls, the Corra Linn Falls (which are about half a mile below Bonnington Falls), and the Stonebyres Falls (which are three miles further down still). The hydro-electric plant would work in conjunction with the steam-power plant of the Clyde Valley Electrical Power Co., which supplied electricity for power purposes in a large area around Glasgow. That company had agreed to take the whole of the electricity generated at the falls and to find the money.

In the Bill the Lanarkshire Hydro-Electric Power Co. sought power to raise £250,000 capital, which could be increased to £400,000 with the consent of the Electricity Commissioners. It also sought power to borrow to the extent of half the issued capital. The plant and works would be carried out by the English Electric Co. and Sir William Arrol & Co. The company could only supply in bulk, and an agreement had been scheduled to the Bill, embodying the arrangement referred to with the Clyde Valley Co., which was to be put into operation if the Bill was passed without substantial alteration.

Mr. R. W. HOGARTH (consulting engineer) gave a brief description of the scheme, and said that the two power stations would be linked up with the Motherwell power station of the Clyde Valley Co. His estimate of the cost of the works and plant at the top falls was £124,000, and at the lower falls £91,000. In addition, there was an item for contingencies and land, amounting to £32,000, making a total of £248,000. Since these calculations were made certain provisional contracts had been entered into in connection with the work, at figures lower than his original estimates.

Mr. RALPH BURY (who appeared for Sir Charles Ross), in cross-examination, said that when the Bill was first promoted it was the intention to depend on the water power alone for supplying current in Lanark and Lesmahagow, and he suggested that the promoters knew all along that they could fall back on the Clyde Valley Co. if they found there was opposition to the Bill. If this Bill were rejected, he said, it would be open to Sir Charles Ross to promote a Bill next session for a scheme dependent on water power only, and to adopt the engineering scheme of the promoters of the present Bill.

On July 24th, Mr. ROBERT ROBERTSON (director of the Clyde Valley Co.), in evidence, said the average price obtained for current for power and lighting in 1923 by the Clyde Valley Co. and the Strathclyde Co. (which was a subsidiary company with distribution powers) was substantially less than the price obtained by the Glasgow Corporation. The average dividend received by the shareholders since the incorporation of the company had been £2 2s. per cent.; the maximum dividend on the ordinary shares was 8 per cent. The company had had an uphill fight, and was just about turning the corner. The terms which had been demanded by Sir Charles Ross, namely, £5 per kW per annum, plus 0.3d. per kWh for electricity generated at the falls, were an impossible proposition, and had the company accepted them it would have had to charge a very high figure for current all through its area. The company had taken expert advice as to what was fair compensation when it was negotiating with riparian owners.

Mr. RALPH FREEMAN (consulting engineer) expressed the opinion that if an attempt were made to develop the Clyde falls separately, and not in conjunction with another system, it would be a failure, because capital charges would overload the scheme.

Mr. JAMES ANNAN (Town Clerk, Lanark) gave evidence in support of the Bill. The Lanark Town Council, he said, had considered the utilisation of these falls itself for generating electricity to supply Lanark, but had found the cost so great that it was impracticable.

Mr. P. J. PYBUS (chairman of the promoting company and managing director of the English Electric Co., Ltd.) said that the profit obtained by the English Electric Co. and Sir William Arrol & Co., who would provide the plant, would be less than average profits on ordinary commercial contracts, and they were getting no promotion profits.

Mr. BURY then pointed out that the plant and works were to be carried out by the English Electric Co., Ltd., and Sir William Arrol & Co., and that one result of the promotion was that it would prevent contracts being put out to competition amongst other English firms. He also suggested that when it was known that there would be opposition to the Bill, the Finance Co. had sold the promotion to the Clyde Valley Co.

Mr. PYBUS disagreed, and said that they had undertaken to provide the installation at competitive prices, and every detail had been checked.

Mr. CLIMIE pointed to the Bill which was passed in 1922 for the utilisation of water power for generating electricity in the Grampians, and said that nothing had been done since it was passed. The promoters of the present Bill were interested in the Lanarkshire scheme for exhibition purposes, and he suggested that they might have done something in connection with the Grampian scheme with that end in view, instead of allowing the work to be postponed for two years.

Mr. HARKER pointed out that there was a Bill in Parliament to revise rating provisions, and so on, which would have to be passed before the Grampians scheme was proceeded with. Also, the scheme was an enormous one as compared with the Lanarkshire scheme.

This closed the case for the Bill, and the Committee adjourned until July 29th.

Wireless in Mines.—Mr. BAKER asked the Secretary for Mines whether his attention had been called to the decision of the American authorities to test wireless as a means of saving life in mining disasters; and whether he would undertake investigations on similar lines.

Mr. SHINWELL said he was aware that experiments had been made in the United States. Experimental work on a small scale had also been undertaken privately in this country and his Department was watching developments both here and abroad. He would communicate the suggestion to the Safety in Mines Research Board.

Imperial Radio Communication.—On July 23rd, Mr. HARTSHORN (Postmaster-General), replying to Sir L. WORTHINGTON-EVANS, said that the Government had decided to adopt the main recommendations of the Donald Committee with regard to Imperial radio communication, which were as follows:—(1) That the State, through the Post Office, should own all radio stations in Great Britain for communication with the oversea dominions, colonies, protectorates, and territories; and (2) that the Post Office should operate directly, under an improved business organisation, all the Empire stations in Great Britain. In the meantime, the Marconi Company had put forward proposals respecting the use of short-wave directive stations (the so-called "beam" stations) for communication between this country and the Dominions and India, and it had made definite arrangements for the erection of a beam station in Canada for communication with this country. The Government was prepared to co-operate in the trial of this new system, and in a few days an agreement would be submitted to the House of Commons (see our "Telegraph Notes" in this issue). The Governments of India and New Zealand had stated that a station of the new type would not meet their requirements, and the Government of India was awaiting replies to an invitation which it had issued for the formation of an Indian company to erect high-power stations in India. The Governments of Australia and South Africa had not reached a final decision, but he understood that they were disposed to allow beam stations to be erected in Australia and South Africa for communication with this country in order to give the new system a trial. H.M. Government had undertaken, in the event of those stations being erected, to provide corresponding installations in this country as extensions of the station to be used for the Canadian service. The Marconi Company had agreed to co-operate whether the decision of the Dominions was in favour of beam stations or high-power stations. It was at present proposed to extend

the Rugby station from 12 to 16 masts, as recommended in the Donald report, but this decision would be subject to reconsideration if, in view of the policy adopted by the Dominions, the extension should prove to be unnecessary. The question of an improved business organisation for the working of the stations was under consideration by a further committee under the chairmanship of Sir Robert Donald. This committee was expected to report very shortly.

Clyde Valley Electrical Power Bill.—On the motion for the second reading of this Bill (which has passed through the House of Lords) in the House of Commons on July 24th, Mr. C. STEPHEN, a Labour member, moved its rejection. It was, he said, the business of the House when a measure came before it to confer further powers on a company of this kind, to look very closely into the conditions of the area which the company served and to make sure that it did not entrench the company and enable it to obstruct the development of electrical power undertakings on national lines. He contended that the interests of the city of Glasgow were not sufficiently protected under the Bill. Other Labour members supported this view, but Sir S. CHAPMAN (Conservative) said that the promoters were prepared, if the Bill passed, to spend £500,000 in the next two years, and this would give employment to many hundreds of people who were at present out of work.

Mr. GOSLING, the Minister of Transport, in explaining that the Government would leave the matter to the judgment of the House, said that the Bill had gone through all its stages in the House of Lords, and the usual thing was for such a Bill to have a second reading in the House of Commons.

The Bill was given a second reading.

Published Specifications.

Compiled expressly for this journal by Patent Agents.
The name of the applicant's patent agent, if any, will be found on the printed specification.
The numbers in parentheses are those under which the specifications will be printed and abridged, and all subsequent proceedings will be taken.

1923.

134. "Amplifying systems, particularly for use in wireless telegraphy and telephony." J. Scott-Taggart and Radio Communication Co., Ltd. January 2nd, 1923. (217,971.)

135. "Coupling of electrical circuits, particularly for wireless telegraphy and telephony." J. Scott-Taggart and Radio Communication Co., Ltd. January 2nd, 1923. (218,105.)

136. "Insulators." J. Scott-Taggart and Radio Communication Co., Ltd. January 2nd, 1923. (218,331.)

173. "Dry-battery machines." L. A. Freedman. January 2nd, 1923. (218,332.)

274. "High-frequency electric signalling systems." E. H. Robinson, J. Scott-Taggart, and Radio Communication Co., Ltd. January 4th, 1923. (218,335.)

304. "Electric circuits for use with electric discharge devices, particularly for high frequency signalling receiving systems." S. Lea, J. Ree, and Radio Communication Co., Ltd. (January 4th, 1923. (218,336.)

2,968. "Train position or progress indicators." I. H. Parsons. February 1st, 1923. (218,341.)

3,055. "Electricity meters." W. M. Mordey and Electrical Apparatus Co., Ltd. February 1st, 1923. (Addition to 194,394.) (218,342.)

3,208. "Production of high-tension unidirectional currents." H. E. Donnithorne. November 2nd, 1923. (218,344.)

4,197. "Means for insulating or isolating the metal parts of electrical fittings." J. Appleby, Junr., and J. E. Sidwell. February 13th, 1923. (218,348.)

5,951. "Electric rotary converters." S. P. Smith and General Electric Co., Ltd. December 3rd, 1923. (218,352.)

6,251. "Electrostatic separation of particles." South Metropolitan Gas Co., Woodall, Duckham & Jones (1920), Ltd., and H. S. Hatfield. March 3rd, 1923. (218,354.)

6,438. "Magneto-electric ignition and lighting apparatus." G. Unterberg. March 6th, 1923. (218,356.)

8,686. "Means for receiving alternating-current signals." E. Potter (F. E. Pernot). March 27th, 1923. (218,361.)

9,042. "Connections or terminals for electric circuits." J. Roberts. April 3rd, 1923. (218,372.)

9,252. "Push-button lifts or the like." Waygood-Otis, Ltd. May 24th, 1922. (198,344.)

9,314. "Method of, and means for generating electromagnetic waves." D. W. Rees. April 5th, 1923. (218,386.)

9,503. "Telephone exchange systems." Western Electric Co., Ltd. (Western Electric Co., Inc.). April 6th, 1923. (218,392.)

9,508. "Process and devices for the rupture of electric currents." C. Chilowsky and J. Saphores. February 12th, 1923. (211,691.)

9,545. "Wireless direction-finding apparatus." Internationalt Radiotelegraf and Telephon Compagni ved Wahnoe & Peters. April 10th, 1922. (195,982.)

9,589. "Electric heating units or elements." A. Brown. April 7th, 1923. (218,393.)

9,593. "Circuit changers for use in tabulating machines of the record-card type." W. Partington and British Tabulating Machine Co., Ltd. April 7th, 1923. (218,394.)

9,628. "Electromagnetic sound apparatus." B. A. Pilkington. April 9th, 1923. (218,396.)

9,889. "Electrical resistances." N. G. Langrish and Metropolitan-Vickers Electrical Co., Ltd. April 11th, 1923. (218,400.)

10,069. "Aerials and like radiating or receiving conductors for wireless systems and apparatus." W. G. Walter. April 13th, 1923. (218,403.)

10,303. "Automatic safety cut-out or switch device for use with electric boiling vessels." P. R. Clark, G. G. Koop, and E. E. Edwards. April 16th, 1923. (Cognate application 11,964/23.) (218,409.)

10,388. "Sound-amplifying and directing appliances." G. A. Morris. April 17th, 1923. (218,412.)

10,480. "Electrical heating devices." E. L. Wiegand. February 1st, 1923. (210,720.)

10,551. "Thermionic oscillation generators." Western Electric Co., Ltd. April 18th, 1922. (196,610.)

11,514. "Magneto-electric machines." British Thomson-Houston Co., Ltd., A. P. Young, and F. A. Fossey. April 28th, 1923. (218,424.)

11,521. "Controlling of the circuits of thermionic valves and the like for radio telegraphy and telephony." F. K. Woodroffe and R. N. Dawson. April 28th, 1923. (218,425.)

11,684. "Loud-speaking arrangements for telephone receivers." H. W. Pearce and J. F. Pollard. June 4th, 1923. (218,428.)

11,711. "Electric switches." A. H. Railing, C. C. Garrard, and A. F. Searle. May 1st, 1923. (218,429.)

11,786. "Filaments for electric incandescent lamps and the like." British Thomson-Houston Co., Ltd. (General Electric Co.). May 1st, 1923. (218,430.)

13,211. "Alternating-current motors for coal-cutting machines and the like." W. A. Logan. May 17th, 1923. (218,438.)

13,260. "Electric switches, relays, and the like." British Thomson-Houston Co., Ltd., and A. S. Fitzgerald. May 17th, 1923. (218,441.)

14,497. "Electric buoy lights." H. Ravenhill and W. Grieve. June 1st, 1923. (218,459.)

14,761. "Sound-producing apparatus or electromagnetic receiving or emitting device." Soc. des Etablissements Gaumont. July 5th, 1922. (Addition to 193,339.) (200,490.)

14,995. "Speed regulation of series-wound direct-current motors." W. E. Porter and J. Bentley. June 8th, 1923. (218,461.)

15,916. "Continuously loaded conductors." Felten & Guilleaume Carlswerk Akt. Ges. July 7th, 1922. (200,497.)

16,121. "Sound-recording and reproducing machines." H. A. Rogers. June 21st, 1923. (Addition to 212,701.) (218,475.)

18,550. "Electric lighting apparatus, with coupled magneto-electric ignition apparatus for motor-cars." G. Unterberg. July 18th, 1923. (218,497.)

18,560. "Apparatus for therapeutic treatment by artificial light." R. H. Davis. July 18th, 1923. (218,498.)

19,135. "Slipper brakes for tramcars." H. P. Stokes and J. W. Tonson. July 26th, 1923. (218,505.)

19,693. "Air-brake dynamo-motors." Armstrong Siddeley Motors, Ltd., and F. R. Smith and B. W. Shilson. August 1st, 1923. (218,510.)

19,937. "Telegraph systems." Western Electric Co., Ltd. August 3rd, 1922. (201,930.)

20,860. "Motor mechanism in electricity meters." Landis & Gyr Akt. Ges. August 18th, 1922. (202,645.)

21,301. "Electric miners' lamps." G. Dienne and Soc. Anon. Le Gaz Pauvre. August 22nd, 1923. (218,522.)

21,318. "Variable resistance device for electric circuits." H. A. Yeward. August 23rd, 1923. (Cognate application, 4,854/24, a divided application on 21,318/23.) (218,523.)

22,659. "Electric sparking plug connectors." F. C. Gardner and J. E. Morton. September 10th, 1923. (218,526.)

24,213. "Electric switches." British Thomson-Houston Co., Ltd. (General Electric Co.). September 28th, 1923. (Patent of addition not granted.) (218,532.)

24,579. "Ignition devices for internal-combustion engines." Bolinders Mekaniska Verkstads Aktiebolag, J. & C. G. October 14th, 1922. (205,483.)

25,481. "Operating of points on railway, tramway, and like tracks." H. R. Byng and J. W. Watson. October 12th, 1923. (218,536.)

26,592. "Tungsten arc lamps." General Electric Co., Ltd. May 5th, 1923. (215,310.)

27,363. "Starting electric luminous discharge lamps and tungsten arc lamps." General Electric Co., Ltd. May 4th, 1923. (215,312.)

28,860. "Electrical relay switch." G. Dumont. December 8th, 1922. (208,127.)

29,097. "Electrolytic tanks." L. A. Carrera. November 18th, 1922. (207,199.)

29,193. "Electrodes for electric welding machines." C. A. Holley and Rose Street Foundry and Engineering Co., Ltd. November 19th, 1923. (218,554.)

30,228. "Illuminated signs, advertisements, and the like." C. K. Roylance. November 30th, 1923. (218,559.)

31,544. "Electromagnetically-actuated valves." Nederlandsche Gist-en Spiritus Fabriek. December 20th, 1922. (208,703.)

31,659. "Electric resistance coils free from induction and capacity." Ringsdorff-Werke Akt. Ges. and P. Eversheim. December 17th, 1923. (218,570.)

32,090. "Reconstruction of electric incandescent lamps." H. E. Fenchelle and Lasarre (London), Ltd. December 21st, 1923. (218,574.)

32,215. "Process for the electro-osmotic purification of glycerine." Elektro-Osmose Akt. Ges. (Graf.-Schwerin Ges.). April 18th, 1923. (214,576.)

1924.

388. "Process for the electro-osmotic purification of glue or gelatin." Electro-Osmose Akt. Ges. (Graf Schwerin Ges.). April 18th, 1923. (214,579.)

2,643. "Telephone systems." Western Electric Co., Ltd. (G. Deakin). February 1st, 1924. (218,589.)

3,906. "Electro-mechanical apparatus for the automatic dropping of any article from aircraft." R. Alkan and G. Lesourd. February 15th, 1924. (218,596.)

4,473. "Method of starting and synchronising induction-synchronous motors." T. Yamamoto. June 7th, 1923. (217,175.)

6,117. "Oscillatory telegraph-telephone systems." C. E. Snell. March 10th, 1924. (218,601.)

7,736. "Process for the protection of metal parts of plant in conducting communication with the earth through streams of water against the harmful influences of stray currents, and apparatus for carrying out the process." F. von Wurstemberger. May 14th, 1923. (216,103.)

8,260. "Potential control apparatus." Igranic Electric Co., Ltd. (Cutler-Hammer Manufacturing Co.). April 17th, 1923. (Divided application on 216,649.) (218,604.)

The Use of Coal.—The Mines Department and the Department of Scientific and Industrial Research have been giving attention to the best means of using the national coal resources. In a joint announcement it is explained that an important decision bearing on this vital problem has recently been taken, which it is hoped will in due course lead not only to greater economy in the use of coal, but to greater employment. The Government has decided to provide at once for the rapid development of the chemical and physical survey of the coal seams on which our knowledge of the suitability of the various types of coal for different purposes depends, and further to encourage all promising new processes for the carbonisation of coal at low temperatures which have reached the stage of commercial production. On the survey side the scheme provides for the establishment of further local committees on which the coal owners, as well as technical experts are to be represented. On the engineering side the scheme offers the assistance, at the cost of public funds, of the Fuel Research Board's station and its staff in the examination of promising processes under conditions which will shortly be made public.

Hens and Electric Light.—*The Synchroniser*, a transatlantic journal, states that opponents of electricity, having exhausted most of their arguments, have turned their attention to the use of electric light for the purpose of increasing the egg-laying capacity of hens. They object to this on humanitarian grounds, but forget that a hen's sole object in life is eating. The provision of electric light stimulates them to spend twice as much time in this practice, and therefore doubles the pleasure of existence for them.